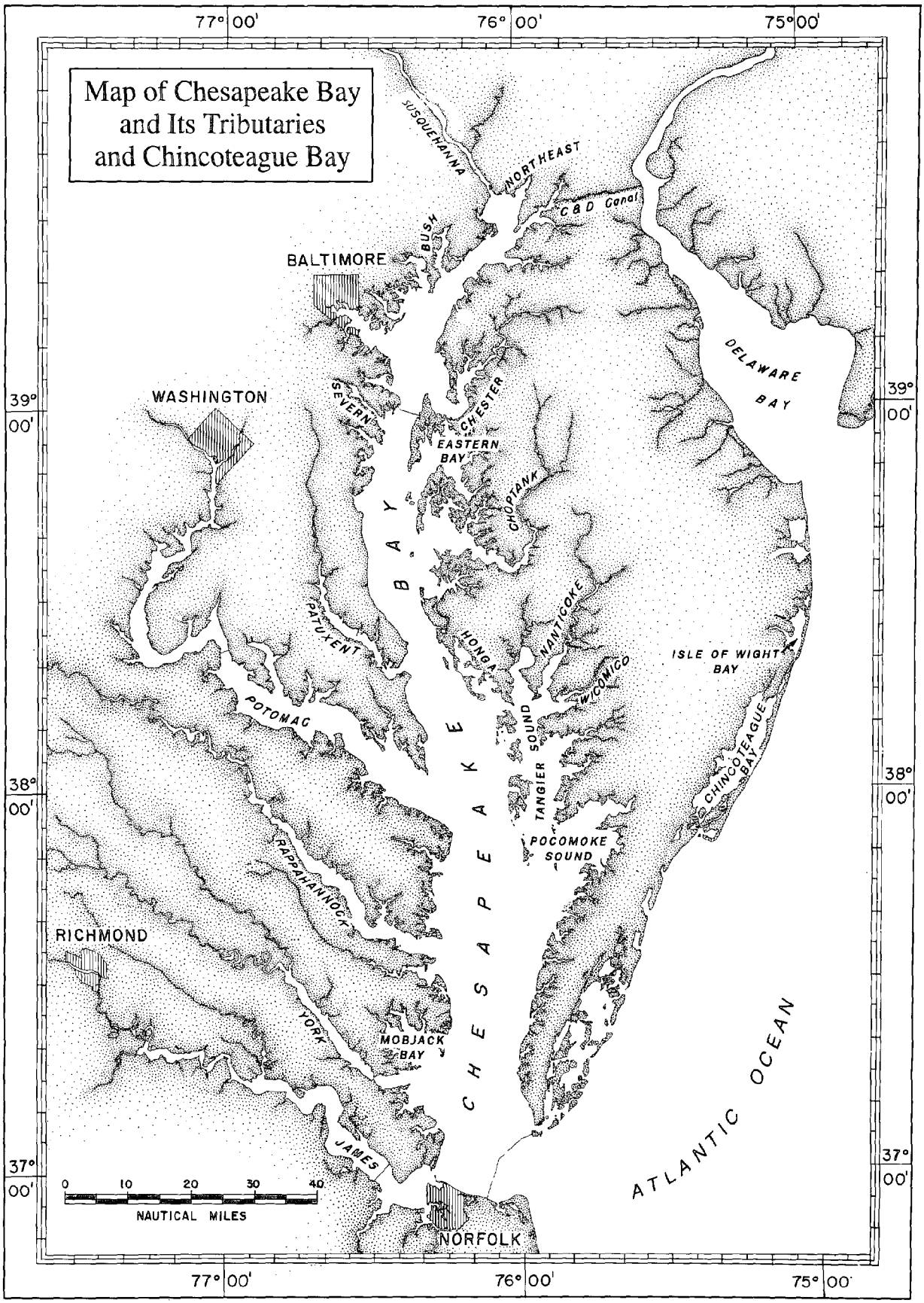
1993 Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay

Virginia Institute of Marine Science
School of Marine Science
The College of William & Mary


Map of Chesapeake Bay and Its Tributaries and Chincoteague Bay
77° 00'
76° 00'
75° 00'
39° 00'
38° 00'
37° 00'
SUSQUEHANNA
NORTHEAST
C & D Canal
BUSH
BALTIMORE
WASHINGTON
SEVERN
CHESTER
EASTERN BAY
CHOPTANK
DELAWARE BAY
PATUXENT
HONGA
NANTICOKE
WICOMICO
ISLE OF WIGHT BAY
POTOMAC
TANGIER SOUND
CHINCOTEAGUE BAY
POCOMOKE SOUND
RAPPAHANNOCK
RICHMOND
YORK
MOBJACK BAY
JAMES
CHESAPEAKE BAY
ATLANTIC OCEAN
0 10 20 30 40
NAUTICAL MILES
NORFOLK

Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay and Tributaries and Chincoteague Bay - 1993

by

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December 1994

Cover Photograph: John Flood, a participant in the Citizens' SAV Survey, holds "doubler" blue crabs (*Callinectes sapidus*) from a large bed of Redhead grass (*Potamogeton perfoliatus*) in Round Bay, at the mouth of Asquith Creek, Severn River, Maryland, 1994. This bed appeared for the first time in 1994. (Photography courtesy of Bob Gilbert of *The Capital* newspaper, Annapolis, Maryland.)

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EXECUTIVE SUMMARY

The distribution of submerged aquatic vegetation, principally rooted vascular macrophytes, in the Chesapeake Bay, its tributaries, and Chincoteague Bay, was mapped from black and white aerial photographs taken during May to October 1993 at a scale of 1:24,000. SAV bed perimeter information was digitized and stored in a computerized data base. Ground truth information was obtained from the U. S. Fish and Wildlife Service; USGS National Center; Harford Community College, Maryland; Maryland-National Capital Parks and Planning Commission, Patuxent River Park; and the College of William and Mary, School of Marine Science, Virginia Institute of Marine Science. Citizen support via the U. S. Fish and Wildlife Service and the Chesapeake Bay Foundation provided additional ground truth information.

In 1993, the Chesapeake Bay had 29,589 hectares of SAV, compared to 28,591 hectares in 1992, with 2,700 hectares (9.0%), 13,901 hectares (47.0%), and 13,018 hectares (44.0%) occurring in the Upper, Middle, and Lower Bay zones, respectively (Figures 1, 2, and 3). SAV generally increased in each of the three zones from 1992. Decreases in some sections (e.g. Mid-Bay Island Complex, Upper Eastern Shore, and Western Shore) were offset by larger increases in other sections (e.g. Choptank River, Eastern Bay, and Chester River sections). SAV increased in abundance in all sections in the Lower Bay zone.

In 1993, in the Upper Bay zone, 66.5% (1,777 hectares) of the SAV was located in the Susquehanna Flats (Section 1). Overall abundance and density of SAV was similar to the 1992 level (1,792 hectares). In the Flats, 85.4% of all SAV beds were classified as very sparse in 1993 (0-10% coverage), while 7.7% of beds were classified as dense (70-100% coverage) (Figure 3). *Myriophyllum spicatum*, *Heteranthera dubia*, *Vallisneria americana*, *Hydrilla verticillata*, *Ceratophyllum demersum*, and *Najas guadalupensis* were the six species reported. In the Upper Eastern Shore (Section 2) there were 184 hectares of SAV in 1993 (99 hectares less than in 1992) located principally in the Elk and lower Sassafras rivers, with *M. spicatum* and *V. americana* found most frequently, especially in the Elk River. Much of the difference from 1992 in the Upper Eastern Shore section was recorded from the Elk River. The Upper Western Shore (Section 3) had 80 hectares of SAV compared to 186 hectares recorded in 1992. SAV was reported from the Gunpowder River area including Dundee Creek; the lower Spesutie Narrows; the Middle and Magothy rivers; and Romney and Delph creeks. SAV was noticeably reduced in Saltpeter Creek from 1992 and was absent from Seneca Creek in 1993. SAV was mapped in the Magothy River for the first time since it was last reported in 1978. *Myriophyllum spicatum*, *Elodea canadensis*, and *Zannichellia palustris* were frequently cited. In the Chester River (Section 4) SAV abundance (629 hectares) was up 374 hectares from 1992. SAV was most abundant adjacent to Eastern Neck, Eastern Neck Island, and in the lower Chester River. *Ruppia maritima* was most commonly cited.

In 1993, 39.3% (5,467 hectares) of the SAV in the Middle Bay zone was found in the Mid-Bay Island Complex (Section 13) which includes the broad shoal area between Smith and Tangier Islands. This is a decrease of 527 hectares over 1992. In this zone, 21.4% (2972 hectares) of the SAV was present in the Middle Eastern Shore (Section 12), primarily in the Barren Island-Honga River area; the Big

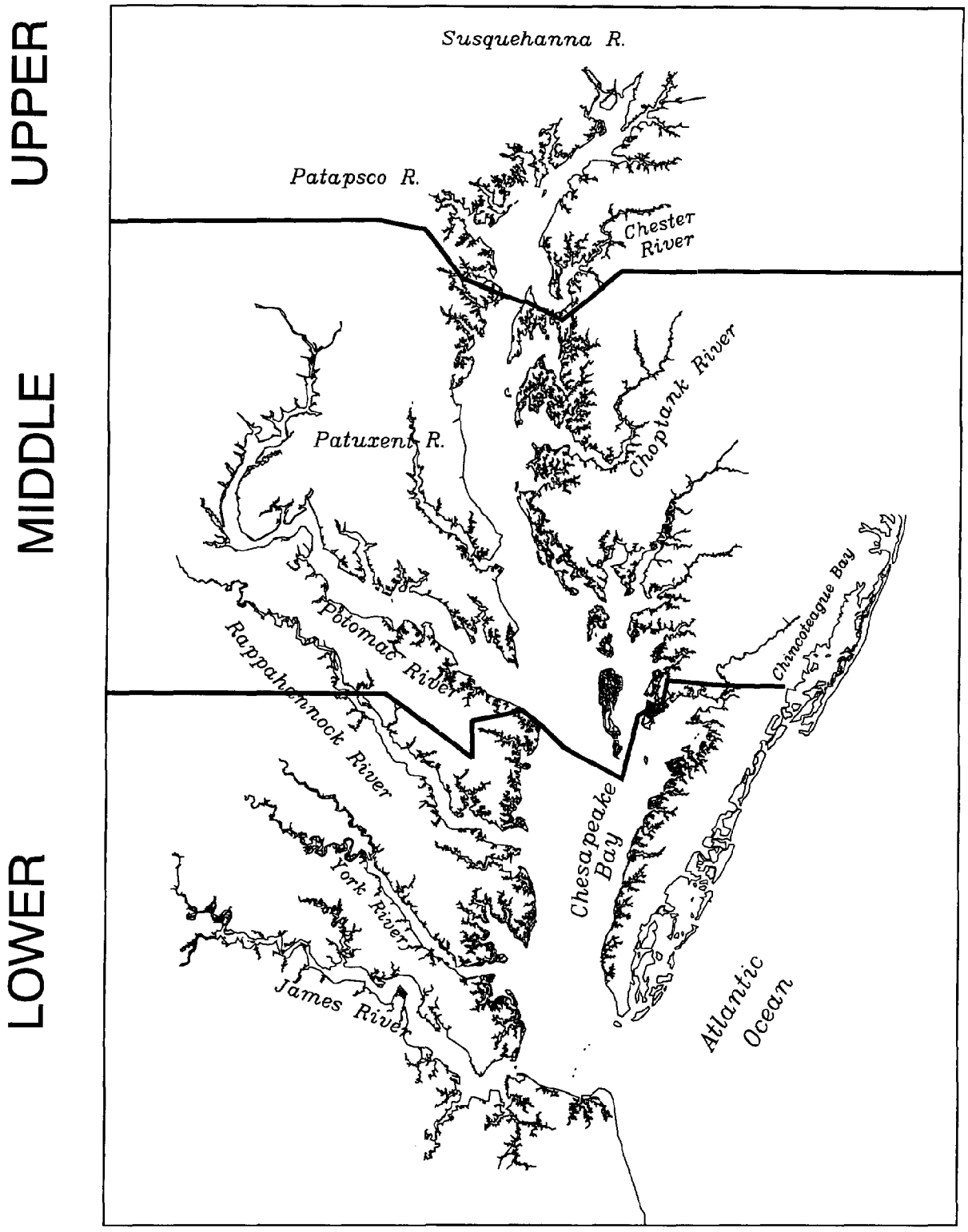

Figure 1. Map of Chesapeake Bay and tributaries with Upper, Middle, and Lower zones, and of Chincoteague Bay, with locations of all SAV beds in 1993 (SAV is shown in red).

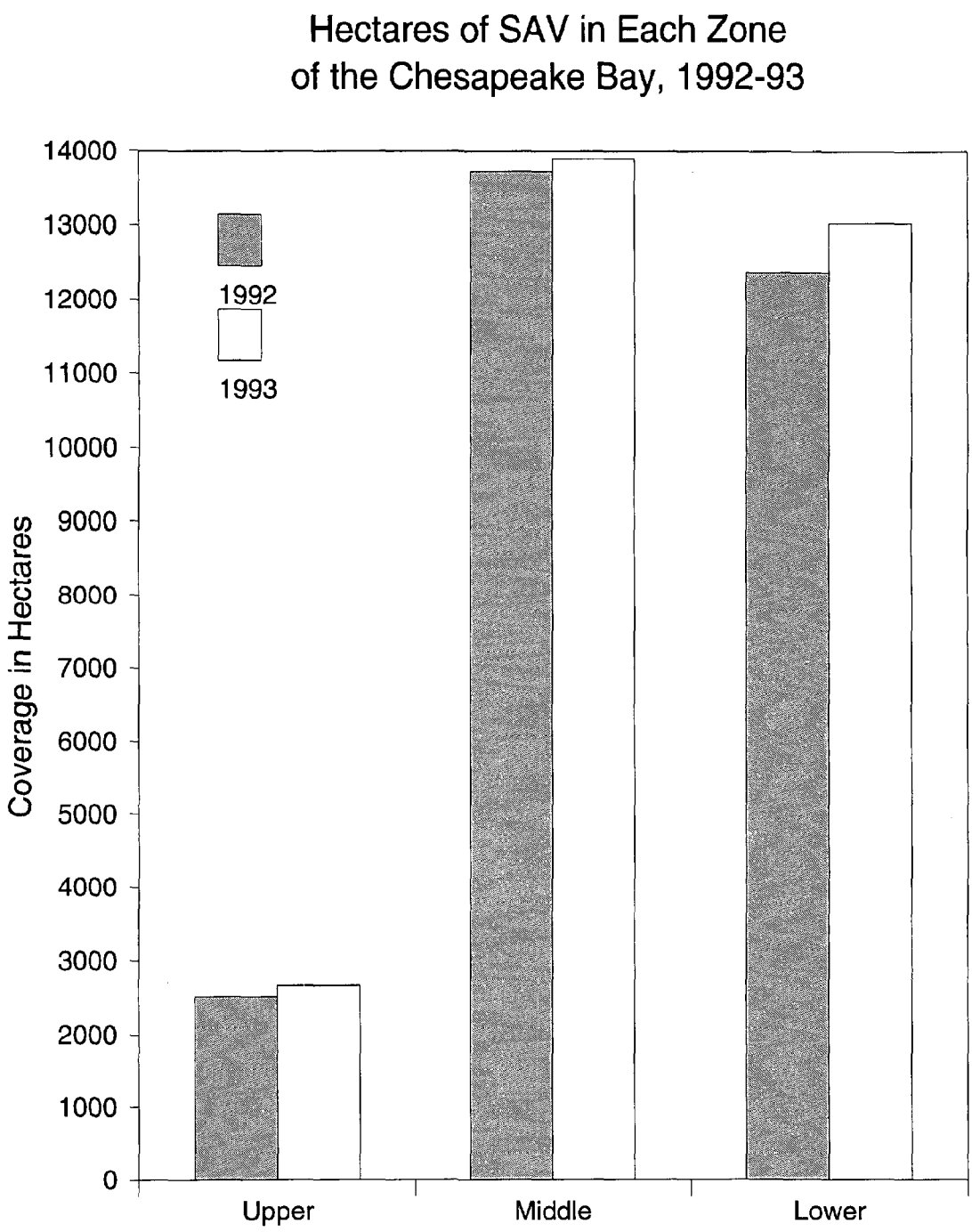

Figure 2. A comparison of the total hectares of SAV for the Upper, Middle, and Lower zones of Chesapeake Bay in 1992 and 1993. (Refer to Figures 1 and 7 for zone locations.)

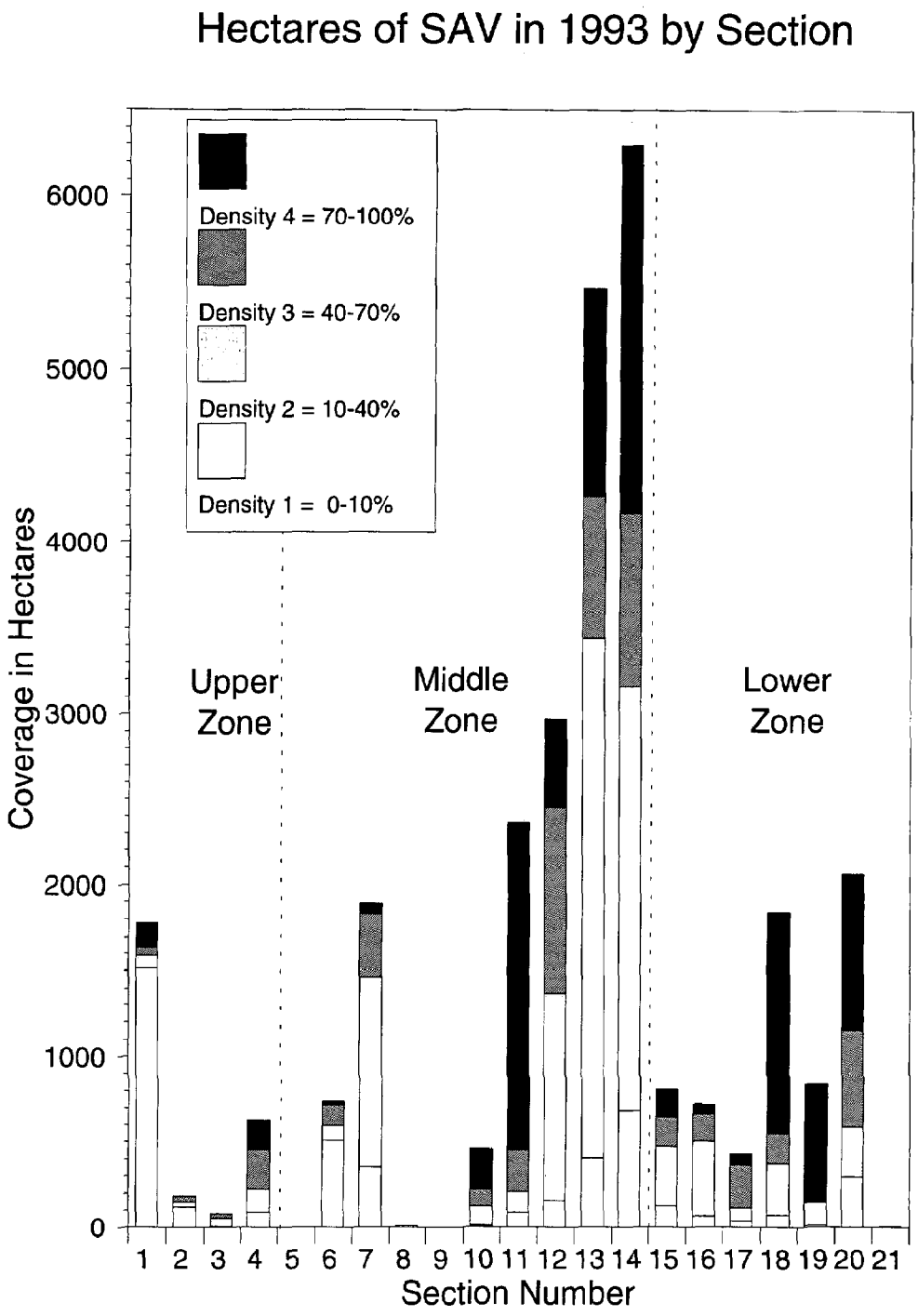

Figure 3. Number of hectares SAV per density class in 1993 by section and zone of Chesapeake Bay. (Refer to Figure 7, Table 3, and Appendix B for section locations and boundaries.)

and Little Annemessex rivers; and the lower section of the Manokin River, with *R. maritima* reported most frequently. SAV was much less abundant in the Barren Island area. No SAV was mapped from the Central Western Shore (Section 5) and Middle Western Shore (Section 9). SAV in the Patuxent River (Section 8) increased from 0 hectares in 1992 to 10 hectares in 1993. Citizens' surveys reported *Z. palustris* and *R. maritima* at numerous locations in the South and Severn rivers. Eleven species were reported in the Patuxent River.

The Middle Bay zone also includes the entire Potomac River, where 2,820 hectares of SAV were present in 1993. SAV was concentrated in two distinct regions: 1) the Upper Potomac River (Section 11) with 2,363 hectares; and 2) the upper portion of the Lower Potomac River (Section 10) with 458 hectares, including Nanjemoy Creek and Port Tobacco River. Although the total abundance of SAV in the Upper Potomac section decreased from 1992 by 99 hectares, there was a notable increase in SAV in the Alexandria quadrangle. In particular, a large shoal area in the middle Potomac River, just above the large bed around the Woodrow Wilson Bridge, which had been previously unvegetated, supported sparse SAV for the first time since this survey was initiated. Ground truth data was reported by USGS and Citizens' surveys with 9 species reported: *M. spicatum, V. americana, H. verticillata, H. dubia, C. demersum, Najas minor, Potamogeton pectinatus, Potamogeton crispus,* and *N. guadalupensis.* SAV in the lower Potomac River also decreased (113 hectares) in 1993. Ground truth data was reported by Citizens' and VIMS surveys with 4 species cited: *Z. palustris, P. crispus, R. maritima,* and *M. spicatum.* SAV continued to increase in the Eastern Bay and Choptank River sections from 1992. SAV in the Eastern Bay (Section 6) increased 183 hectares from 1992 to a total of 737 hectares in 1993, while in the Choptank River (Section 7) it increased 809 hectares from 1992 to a total of 1,894 hectares in 1993. Most of the increase in the Eastern Bay occurred in Cox Creek, Crab Alley Bay, around Parson Island, and Piney Neck Point. In the Choptank River section, SAV beds were most abundant in Harris and Broad creeks and in Trippe Bay. Two species were reported from Section 6, with *R. maritima* most commonly cited. Three species were reported from Section 7, with *R. maritima* most commonly cited.

Distribution and abundance of SAV in 1993, in the Lower Bay zone, were similar to 1992. In this zone, 48.4% (6,299 hectares) of the SAV was found in the Lower Eastern Shore (Section 14) around the Fox, Cedar, Webb, and Halfmoon islands; and the mouths of major creeks (i.e. Cherrystone Inlet; Hungars, Mattawoman, Nassawadox, Occohannock, Craddock, Pungoteague, Nandua, and Onancock creeks; and Beasley Bay). Along the western shore of the Chesapeake Bay, SAV was abundant in Mobjack Bay (Section 18) (14.2% of SAV in the Lower Bay zone), in the lower York River (Section 19) (6.5% of SAV in the Lower Bay zone), and in the Lower Western Shore (Section 20), specifically Back River and the Drum Island Flats area adjacent to Plum Tree Island (15.9% of SAV in the Lower Bay zone). Sparse SAV was documented for a segment of the south shore of the York River, downstream from Yorktown, for the first time in over twenty years (Orth and Gordon, 1975). There were 813 hectares of SAV mapped in the Reedville Region (Section 15) in 1993, a 4.5% increase over 1992. There were 431 hectares of SAV identified in 1993 in the New Point Comfort Region (Section 17), compared to 396 hectares in 1992. SAV abundance was up 23.1% from 1992 in both the Piankatank and Rappahannock rivers (Section 16). The James River (Section 21) had 4 hectares of SAV in 1993. *Zostera marina* and *R. maritima* were the abundant species in this zone.

SAV in the Chincoteague Bay section increased in distribution with 3,576 hectares mapped in 1993 compared to 3,324 hectares in 1992. Most of the SAV in Chincoteague and Sinepuxent bays, which consisted mainly of *Z. marina* and *R. maritima*, was located along the eastern side of the bay behind Assateague Island. Some small beds, consisting mainly of *R. maritima*, were located along the eastern side of Isle of Wight and Assawoman bays.

ACKNOWLEDGEMENTS

We would like to gratefully acknowledge all federal and state agencies who financially supported this project: the U. S. Environmental Protection Agency (USEPA); the U. S. Fish and Wildlife Service (USFWS); the Virginia Department of Environmental Quality's and MD-DNR's Coastal Resources Management Program of the National Oceanographic and Atmospheric Administration (NOAA), under the Coastal Zone Management Act of 1972 as amended by the Office of Ocean Coastal Resource Management (OCRM); the Maryland Department of Natural Resources (MD-DNR); and the Virginia Institute of Marine Science, School of Marine Science, College of William and Mary (VIMS). Also, we thank Allied - Signal, Inc. for providing supplemental funding for this work.

Acknowledgement would not be complete without commendation for the groups which provided ground truthing of SAV beds which was used in conjunction with interpretation of the 1993 photography. USFWS with the Chesapeake Bay Foundation (CBF) organized citizens to report locations and species composition of grass beds around the bay. The U.S. Geological Survey (USGS), the USFWS, and Stan Kollar of Harford Community College (HCC), Maryland, provided ground truth information for certain specific regions of the Maryland portion of the Bay. Patuxent River Park staff provided ground truth data for the Patuxent River. Ken Moore, Curtis Harper, Jill Goodman, Susan Bogardy, and James Fishman of VIMS provided ground truth information for the lower bay.

The production of this report required the dedication of numerous scientists, technicians, artists, photographers, and others. The following people deserve a note of thanks: Rich Batiuk and Carin Bisland, USEPA-Chesapeake Bay Program Office; Ed Pendleton and Kathyrn Reshetiloff, USFWS; Vincent Pito, MD-DNR; and Christina Pompa, CBF.

We are especially grateful to the dedicated VIMS personnel who contributed greatly to the production of this report: Leah Nagey, Krisna Davis, Carol Hayes, and Susan Bogardy for their tremendous assistance and perseverance in digitizing the SAV maps, editing the digital data files, mapping ground truth information, and for their constant, careful efforts to maintain high quality control; Ellen F. McLean for assistance in edgematching ARC/INFO SAV maps and for producing SAV section plots for this report; Wanda Cohen, Kay Stubblefield, and Sylvia Motley of the VIMS Publications Center for report production services; and Pat Hall for computer services.

Air Photographics, Inc. conducted the aerial photographic missions and was responsible for the high quality aerial photographs.

SAV SPECIES

The term "submerged aquatic vegetation" for the purpose of this report encompasses 20 taxa from 10 vascular macrophyte families and 3 taxa from 1 freshwater macrophytic algal family, the Characeae, but excludes all other algae, both benthic and planktonic, which occur in Chesapeake Bay and its tributaries (Appendix A). Although these other algae do constitute a portion of the SAV biomass in Chesapeake Bay and its tributaries (Humm, 1979), this study has not attempted to identify, delineate, or discuss the algal component of the vegetation nor its relative importance in the flora, except for the Characeae. This is the case, for example, with the benthic marine algae, including many macrophytes, which sometimes co-occur in the same beds as vascular plants, even as epiphytes on vascular plants.

Ten species of submerged aquatic vegetation are commonly found in the Chesapeake Bay and its tributaries. *Zostera marina* (eelgrass) is dominant in the lower reaches of the bay. *Myriophyllum spicatum* (Eurasian watermilfoil), *Potamogeton pectinatus* (sago pondweed), *Potamogeton perfoliatus* (redhead grass), *Zannichellia palustris* (horned pondweed), *Vallisneria americana* (wild celery), *Elodea canadensis* (common elodea), *Ceratophyllum demersum* (coontail), and *Najas guadalupensis* (southern naiad) are less tolerant of high salinities and are found in the middle and upper reaches of the bay (Stevenson and Confer, 1978; Orth et al., 1979; Orth and Moore, 1981, 1983). *Ruppia maritima* (widgeon grass) is tolerant of a wide range of salinities and is found from the bay mouth to the Susquehanna Flats. Approximately 13 other species are only occasionally found. When present, these species occur primarily in the middle and upper reaches of the bay and the tidal rivers (Appendix A). *Hydrilla verticillata* (hydrilla), a recently introduced species, presently dominates SAV beds in the tidal freshwater reaches of the Potomac River. It has also been reported again in 1993 in the Susquehanna River and Flats where its growth has not been as widespread as in the Potomac River (Kollar, pers. comm.).

Zostera marina and *R. maritima* are the dominant species reported from Chincoteague Bay.

METHODS

INTRODUCTION

Black and white aerial photography at a scale of 1:24,000 was the principal source of information used to assess distribution and abundance of SAV in Chesapeake Bay, its tributaries, and Chincoteague Bay in 1993. There were 1,500 photographs from 137 flight lines which were carefully examined to identify all SAV beds visible on the photography. Outlines of SAV beds were subsequently drawn onto USGS 7.5 minute quadrangles and then digitized, which provided a digital data base for analysis of bed areas and locations. Ground survey information collected in 1993 was tabulated, placed onto the same 7.5 minute quadrangles, and entered into the SAV digital data base.

AERIAL PHOTOGRAPHY

The 1993 SAV aerial photography was obtained by Air Photographics (Martinsburg, West Virginia) using a Wild RC-20 camera with a 153 mm (6 inch) focal length Aviogon lens and Agfa Pan 200 film. The camera was mounted in the bottom fuselage of Air Photographics' Piper Aztec, a twin engine reconnaissance aircraft. Photography was acquired at an altitude of approximately 12,000 feet, which yielded 1:24,000 scale photographics.

Flight lines to obtain the photography were predetermined by Air Photographics to include all areas known to have SAV, as well as those areas which could potentially have SAV (i.e. all areas where water depths were less than 2 m at mean low water). There were 137 flight lines covering 1,764 miles of shoreline and yielding 1,500 exposures. Flight lines included land features that were necessary to establish control points for accurate mapping (Figure 4). Sections of the upper Rappahannock, upper York, and most of the James rivers were not photographed for analysis because of prior determination of the continued absence of SAV in these areas.

Flight lines were prioritized by sections. Flights were timed to occur during the peak growing season of species known to occur in the sections. In addition, specific areas with significant SAV coverage were given priority. Dates of photography for each quadrangle are noted on each map in Appendix C.

General guidelines followed during acquisition of aerial photography (Table 1) address tidal stage, plant growth, sun elevation, water and atmospheric transparency, turbidity, wind, sensor operation, and plotting. Adherence to these guidelines assured acquisition of photography under nearly optimal conditions for detection of SAV, thus insuring accurate photointerpretation.

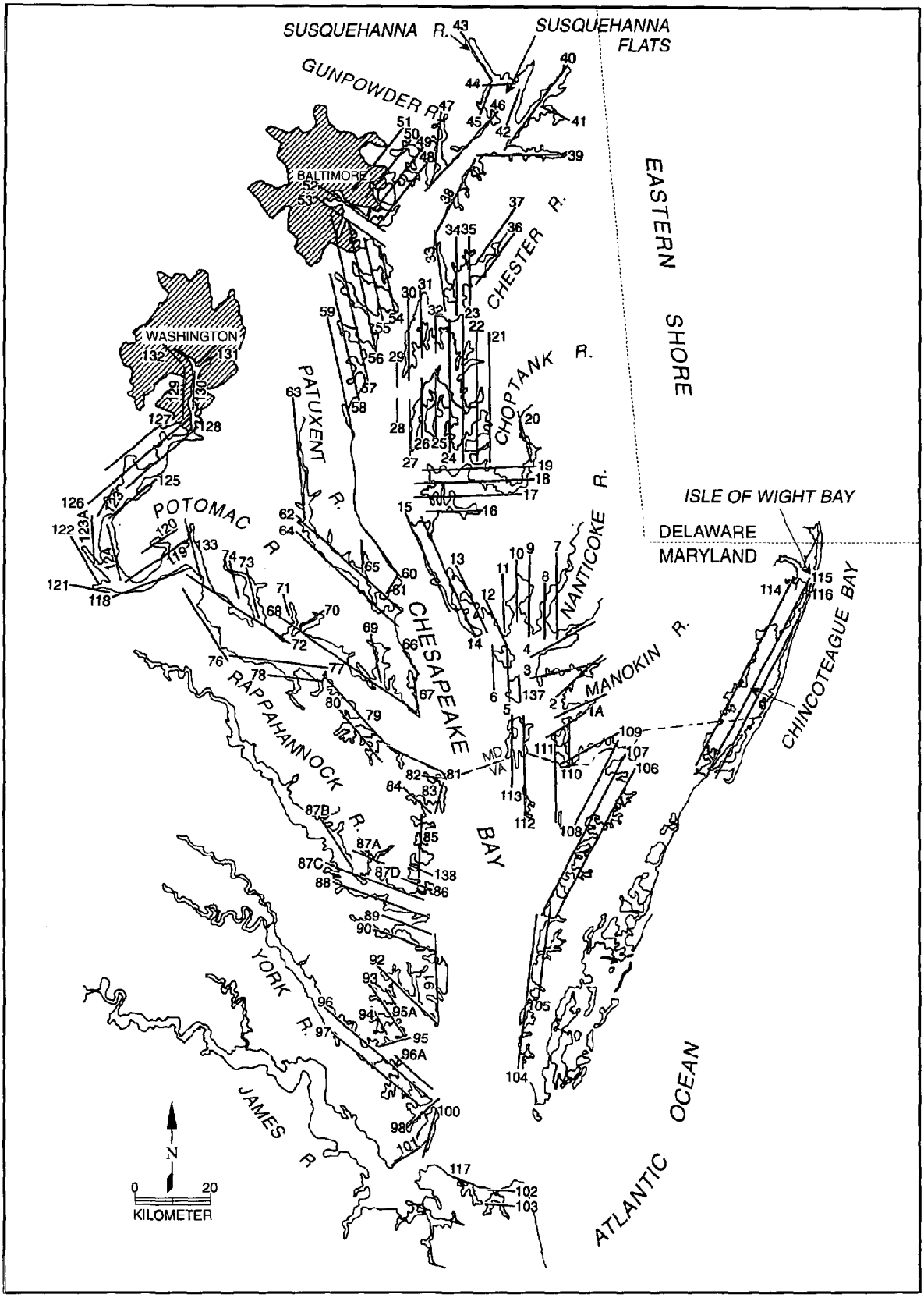

Figure 4. Map of Chesapeake Bay, its tributaries, and of Chincoteague Bay with approximate locations of flight lines for 1993 SAV photography.

TABLE 1

Guidelines Followed During Acquisition of Aerial Photographs.

1. Tidal Stage - Photography was acquired at low tide, +/- 0-1.5 ft., as predicted by the National Ocean Survey tables.

2. Plant Growth - Imagery was acquired when growth stages ensured maximum delineation of SAV, and when phenologic stage overlap was greatest.

3. Sun Angle - Photography was acquired when surface reflection from sun glint did not cover more than 30 percent of frame. Sun angle was generally between 20° and 40° to minimize water surface glitter. At least 60 percent line overlap and 20 percent side lap was used to minimize image degradation due to sun glint.

4. Turbidity - Photography was acquired when clarity of water ensured complete delineation of grass beds. This was visually determined from the airplane to insure that SAV could be seen by the observer.

5. Wind - Photography was acquired during periods of no or low wind. Off-shore winds were preferred over on-shore winds when wind conditions could not be avoided.

6. Atmospherics - Photography was acquired during periods of no or low haze and/or clouds below aircraft. There could be no more than scattered or thin broken clouds, or thin overcast above aircraft, to ensure maximum SAV to bottom contrast.

7. Sensor Operation - Photography was acquired in the vertical mode with less than 5 degrees tilt. Scale/altitude/film/focal length combination permitted resolution and identification of one square meter area of SAV (at the surface).

8. Plotting - Each flight line included sufficient identifiable land area to assure accurate plotting of grass beds.

Deviation from any of these guidelines required prior approval by VIMS staff. Quality assurance and calibration procedures were consistently followed. The altimeter was calibrated annually by the Federal Aviation Administration. Camera settings were selected by automatic exposure control. Sun angle was measured with a sensor on the plane. Flight lines were plotted on 1:250,000 scale maps to allow for overlap of photography. To minimize image degradation due to sun glint, the camera was equipped with a computer controlled intervalometer which established 60% line overlap and 20% sidelap. An automatic bubble level held the camera to within one degree tilt. The scale/altitude/film/focal length combination was coordinated so that SAV patches of one square meter could be resolved. Wind speed was monitored hourly. Under normal operating conditions, flights were usually conducted under wind speeds less than 10 mph. Above this speed, wind-generated waves stir bottom sediments which can easily obscure SAV beds in less than one hour. The pilot used experiential knowledge to determine what acceptable level of turbidity would allow complete delineation of SAV beds. During optimum flight conditions the pilot was able to distinguish bottom features such as SAV or algae at low tide. Excessively turbid conditions precluded photography. Determination of optimum cloud cover level was based on pilot experience. Records of this parameter were kept in a flight notebook. Every attempt was made to acquire photographs when there was no cloud cover below 12,000 feet. Cloud cover did not exceed 5% of the area covered by the camera frame. A thin haze layer above 12,000 feet was generally acceptable. Experience with the Chesapeake Bay has shown that optimal atmospheric conditions generally occur two to three days following passage of a cold front, when winds have shifted from north-northwest to south and have moderated to less than 10 mph. Within the guidelines given for prioritizing and executing the photography, the flights were planned to coincide with these atmospheric conditions where possible.

All film was processed by Air Photographics. A 9 inch x 9 inch black and white contact print was produced for each exposed frame. Each photograph was labeled with the date of acquisition as well as flight line number. Film and photographs were stored under appropriate environmental conditions to prevent degradation.

MAPPING PROCESS

For this analysis USGS 7.5 minute quadrangle maps were utilized for mapping SAV beds from aerial photography, for digitizing the SAV beds, and for compiling SAV bed area measurements. Figure 5 gives locations of 179 quadrangles in the study area which includes all regions with potential for SAV growth. Most quadrangles are sequentially numbered for efficient access to data. The name corresponding to each quadrangle in Figure 5 is listed in Table 2. Identification and delineation of SAV beds by photointerpretation utilized all available information including: knowledge of aquatic grass signatures on film, distribution of SAV in 1993 from aerial photography, 1993 ground truth information, and aerial site surveys. USGS 7.5 minute quadrangle maps (1:24,000 scale) printed by

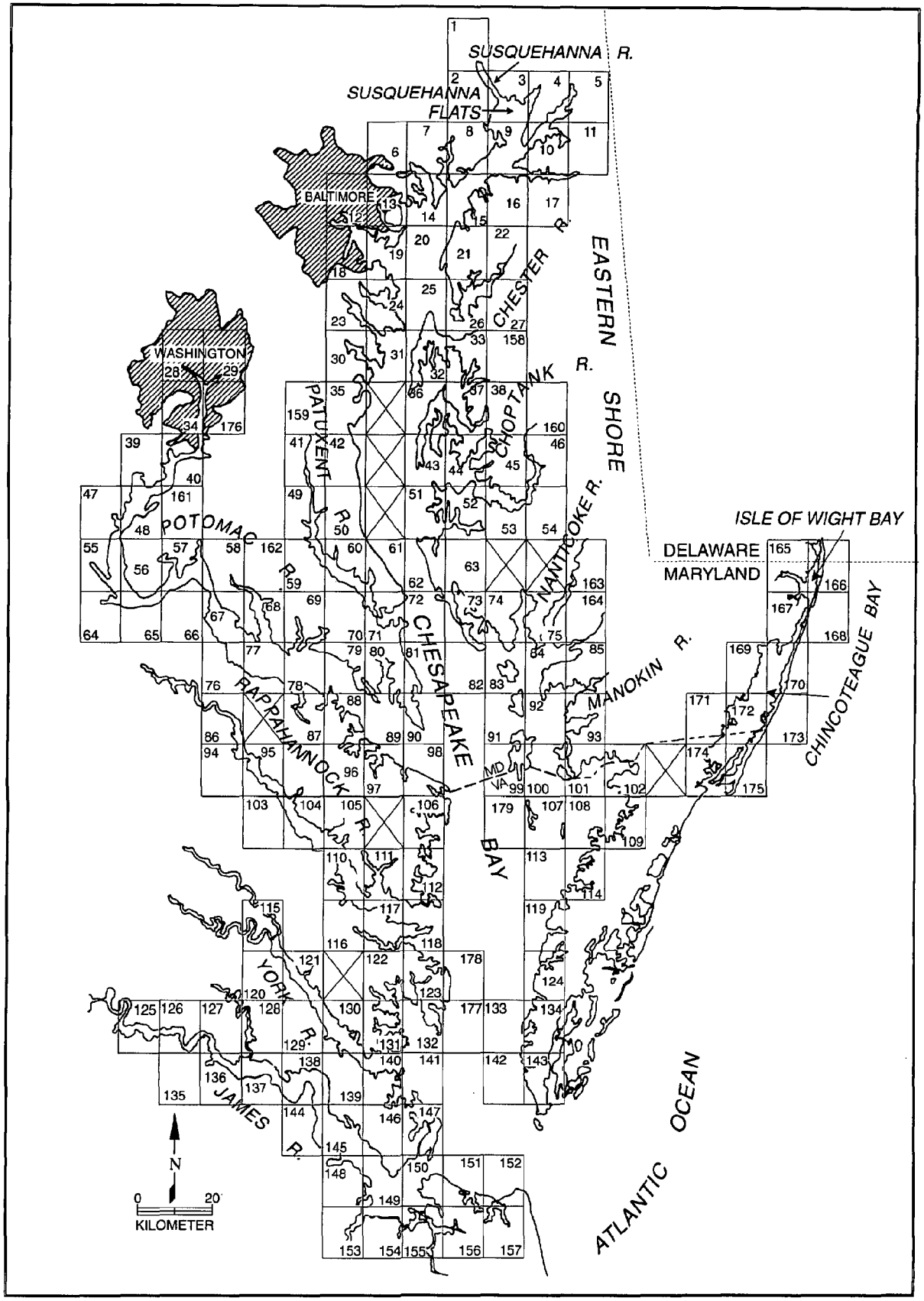

Figure 5. Location of USGS 7.5 minute quadrangles in Chesapeake Bay, its tributaries, and in Chincoteague Bay with corresponding code numbers. (See Table 2 for quad names.)

TABLE 2

List of USGS 7.5 Minute Quadrangles for Chesapeake Bay and Chincoteague Bay SAV Study Areas with Corresponding Code Numbers. (See Figure 5 for Location of Quadrangles. ARC/INFO Generated 7.5 Minute Quadrangles with SAV Beds and Ground truthing Are Reproduced in Appendix C.)

001. Conowingo Dam, Md.-Pa.
002. Aberdeen, Md.
003. Havre de Grace, Md.
004. North East, Md.
005. Elkton, Md.-Del.
006. White Marsh, Md.
007. Edgewood, Md.
008. Perryman, Md.
009. Spesutie, Md.
010. Earleville, Md.
011. Cecilton, Md.
012. Baltimore East, Md.
013. Middle River, Md.
014. Gunpowder Neck, Md.
015. Hanesville, Md.
016. Betterton, Md.
017. Galena, Md.
018. Curtis Bay, Md.
019. Sparrows Point, Md.
020. Swan Point, Md.
021. Rock Hall, Md.
022. Chestertown, Md.
023. Round Bay, Md.
024. Gibson Island, Md.
025. Love Point, Md.
026. Langford Creek, Md.
027. Centreville, Md.
028. Washington West, Md.-D.C.-Va.
029. Washington East, D.C.-Md.
030. South River, Md.
031. Annapolis, Md.
032. Kent Island, Md.
033. Queenstown, Md.
034. Alexandria, Va.-D.C.-Md.
035. Deale, Md.
036. Claiborne, Md.
037. St. Michaels, Md.
038. Easton, Md.
039. Fort Belvoir, Va.-Md.
040. Mt. Vernon, Md.-Va.
041. Lower Marlboro, Md.
042. North Beach, Md.
043. Tilghman, Md.
044. Oxford, Md.
045. Trappe, Md.
046. Preston, Md.
047. Quantico, Va.-Md.
048. Indian Head, Va.-Md.
049. Benedict, Md.
050. Prince Frederick, Md.
051. Hudson, Md.
052. Church Creek, Md.
053. Cambridge, Md.
054. East New Market, Md.
055. Widewater, Va.-Md.
056. Nanjemoy, Md.
057. Mathias Point, Md.-Va.
058. Popes Creek, Md.
059. Mechanicsville, Md.
060. Broomes Island, Md.
061. Cove Point, Md.
062. Taylors Island, Md.
063. Golden Hill, Md.
064. Passapatanzy, Md.-Va.
065. King George, Va.-Md.
066. Dahlgren, Va.-Md.

TABLE 2 (continued)

067. Colonial Beach North, Md.-Va.
068. Rock Point, Md.
069. Leonardtown, Md.
070. Hollywood, Md.
071. Solomons Island, Md.
072. Barren Island, Md.
073. Honga, Md.
074. Wingate, Md.
075. Nanticoke, Md.
076. Colonial Beach South, Va.-Md.
077. Stratford Hall, Va.-Md.
078. St. Clements Island, Va.-Md.
079. Piney Point, Md.-Va.
080. St. Marys City, Md.
081. Point No Point, Md.
082. Richland Point, Md.
083. Bloodsworth Island, Md.
084. Deal Island, Md.
085. Monie, Md.
086. Champlain, Va.
087. Machodoc, Va.
088. Kinsale, Va.-Md.
089. St. George Island, Va.-Md.
090. Point Lookout, Md.
091. Kedges Straits, Md.
092. Terrapin Sand Point, Md.
093. Marion, Md.
094. Mount Landing, Va.
095. Tappahannock, Va.
096. Lottsburg, Va.
097. Heathsville, Va.-Md.
098. Burgess, Va.-Md.
099. Ewell, Md.-Va.
100. Great Fox Island, Va.-Md.
101. Crisfield, Md.-Va.
102. Saxis, Va.-Md.
103. Dunnsville, Va.
104. Morattico, Va.
105. Lively, Va.
106. Reedville, Va.
107. Tangier Island, Va.
108. Chesconessex, Va.
109. Parksley, Va.
110. Urbanna, Va.
111. Irvington, Va.
112. Fleets Bay, Va.
113. Nandua Creek, Va.
114. Pungoteague, Va.
115. West Point, Va.
116. Saluda, Va.
117. Wilton, Va.
118. Deltaville, Va.
119. Jamesville, Va.
120. Toano, Va.
121. Gressitt, Va.
122. Ware Neck, Va.
123. Mathews, Va.
124. Franktown, Va.
125. Westover, Va.
126. Charles City, Va.
127. Brandon, Va.
128. Norge, Va.
129. Williamsburg, Va.
130. Clay Bank, Va.
131. Achilles, Va.
132. New Point Comfort, Va.
133. Cape Charles, Va.
134. Cheriton, Va.
135. Savedge, Va.
136. Claremont, Va.
137. Surry, Va.
138. Hog Island, Va.
139. Yorktown, Va.
140. Poquoson West, Va.
141. Poquoson East, Va.
142. Elliotts Creek, Va.
143. Townsend, Va.
144. Bacons Castle, Va.

TABLE 2 (concluded)

145. Mulberry Island, Va.
146. Newport News North, Va.
147. Hampton, Va.
148. Benns Church, Va.
149. Newport News South, Va.
150. Norfolk North, Va.
151. Little Creek, Va.
152. Cape Henry, Va.
153. Chuckatuck, Va.
154. Bowers Hill, Va.
155. Norfolk South, Va.
156. Kempsville, Va.
157. Princess Anne, Va.
158. Wye Mills, Md.
159. Bristol, Md.
160. Fowling Creek, Md.
161. Port Tobacco, Md.
162. Charlotte Hall, Md.
163. Mardela Springs, Md.
164. Wetipquin, Md.
165. Selbyville, Md.
166. Assawoman Bay, Md.
167. Berlin, Md
168. Ocean City, Md.
169. Public Landing, Md.
170. Tingles Island, Md.
171. Girdle Tree, Md.-Va.
172. Boxiron, Md.-Va.
173. Whittington Point, Md.-Va.
174. Chincoteague West, Va.
175. Chincoteague East, Va.
176. Anacostia, D.C.-Md.
177. East of New Point Comfort, Va.
178. Bethel Beach, Va.
179. Goose Island, Va.

the Mid-Continent Mapping Center of the National Cartographic Information Center on stable transparent mylar were used as base maps. Distortion-free, identical copies of these base maps were made at the same scale on stable transparent mylar using a contact diazo process.

SAV beds from the 1993 aerial photographs were then mapped onto these diazo mylar copies of USGS 7.5 minute quadrangles. Delineation of each SAV bed was facilitated by superimposing the photographic print with the appropriate diazo mylar quadrangle on a light table. SAV bed boundaries were then traced directly onto the diazo mylar quadrangle with a pencil. Where minor scale differences were evident between a photograph and a quadrangle, or where significant shoreline erosion or accretion had occurred since USGS publication of a map, either a best fit was obtained or shoreline changes were noted on the quadrangle.

In addition to delineating SAV bed boundaries, an estimate of SAV density within each bed was made by visually comparing each bed to an enlarged Crown Density Scale similar to those developed for estimating forest tree crown cover from aerial photography (Figure 6). Bed density was categorized into one of four classes based on a subjective comparison with the density scale. These were: 1, very sparse (<10% coverage); 2, sparse (10-40%); 3, moderate (40-70%); or 4, dense (70-100%). Either the entire bed or subsections within the bed were assigned a bed density number (1 to 4) corresponding to the above density classes. Some beds were subsectioned to delineate where variations in SAV density occurred. Additionally, each distinct SAV unit (bed or bed subsection) was assigned an identifying two letter designation unique to its map. Subsections were further identified as contiguous beds by the addition of two letters unique to that sequence. These contiguous bed identifications aid the tracking and analysis of single natural bed units that were subsectioned due to variation in SAV density. Coupled with the appropriate SAV map number and year of photography, these two letter designations uniquely identify each SAV bed in the data base.

SAV PERIMETER DIGITIZATION AND QUALITY ASSURANCE PROCEDURES

The perimeters of all SAV beds mapped from the aerial photography onto the diazo mylar copies were digitized in ARC/INFO, using an Altek Model 41 tablet, with a resolution of .001 inches (.00254 cm) and an accuracy of .005 inches (.0127 cm). The beds for each quadrangle were digitized twice into two separate ARC/INFO coverages. Each coverage was plotted at an exact scale of 1:24,000 on translucent plotter paper and overlaid on the original mylar for visual checking. In instances where the digitized SAV bed boundaries did not correspond to the original, the bed was re-digitized. Once the SAV outlines on both coverages passed visual inspection, a bed-by-bed comparison of the areas (sq. meters) was made as an additional quality assurance check. Beds were rejected and redigitized if they were larger than 1 hectare and there was a difference of greater than 0.1% area between the two coverages. The bed-by-bed comparison was useful in identifying instances where SAV beds were incorrectly labelled, thus eliminating coding errors.

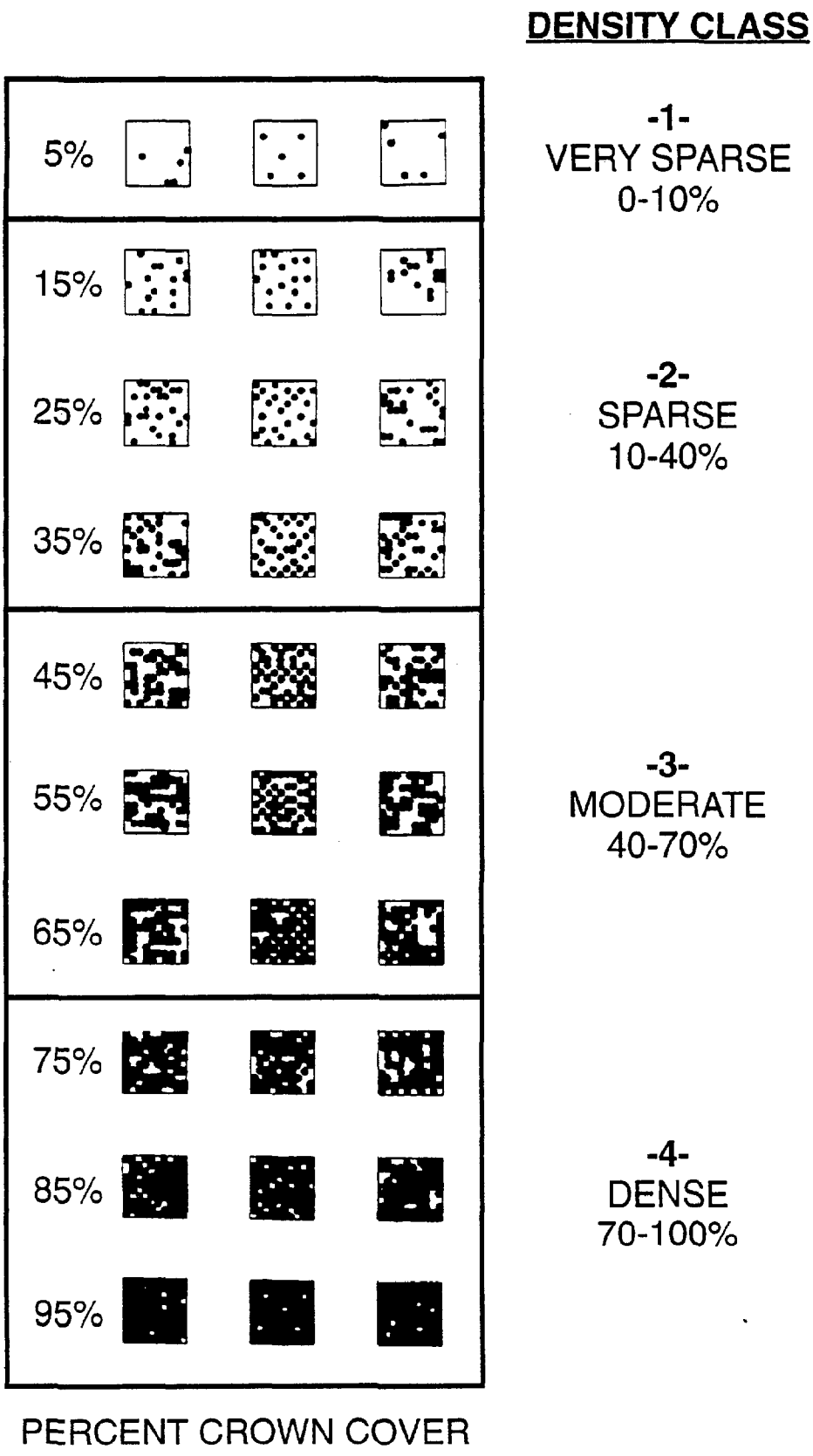

Figure 6. Crown density scale used for estimating density of SAV beds from aerial photography. (Rows of squares with black and white patterns represent three different arrangements of vegetated cover for a given percentage.)

Prior to each digitization session, the Altek instrument was checked manually against a digitizing standard. This was accomplished by first securing a diazo mylar quadrangle with SAV polygons to the digitizing tablet. Then the mylar standard was secured to the same quadrangle and digitized. The digitized area of each standard was compared to the known area of the standard. If a variation between the known and the mean of the observed areas exceeded 1.0%, the maps were redigitized. In addition, visual checks were made with respect to the absolute location of the digitizing standard as secured to the map.

Maximum accuracy was maintained by exclusively using mylar quadrangles and standards rather than paper ones, which can change scale as a function of changes in air temperature and humidity in the digitizer room.

Standard operating procedures (SOPs) were developed to facilitate orderly and efficient processing of the 1993 SAV maps and the SAV computer files produced from them, and to comply with the need for consistency, quality assurance, and quality control. SOPs developed include: a detailed procedure for digitization of SAV maps; a digitizer log in which all operations were recorded and dated, which was used to guide and record editing operations; and a flow chart used to track progress of all operations.

CALCULATION OF 1993 SAV AREAS

The SAV coverages in UTM ARC/INFO Zone 18 format were used to calculate area in square meters for all SAV beds. These areas are reported as USGS 7.5 minute quadrangle section, and zone totals in the tables in the Results section. Section and zone totals were calculated by using an overlay operation of the polygons on the SAV beds in ARC/INFO. The definition of the sections used in this analysis are provided in Table 3.

ORGANIZATIONAL PROCEDURES FOR ANALYSIS AND DISCUSSION

Discussion of the distribution of SAV in Chesapeake Bay and tributaries has been organized into three zones as established by Orth and Moore (1982) and modified by Orth et al., (1989) (Figure 7). The Lower Bay zone is the area from the entrance of the bay to a line originating from Smith Point at the mouth of the Potomac River, extending to approximately 3 nautical miles south of Tangier Island, then extending to just below the Little Annemessex River mouth. From this line north to the Chesapeake Bay Bridge at Kent Island is the area referred to as the Middle Bay zone. The area between the Chesapeake Bay Bridge and the Susquehanna Flats is referred to as the Upper Bay zone.

TABLE 3

Area Descriptions for Each of the 21 Sections of the Chesapeake Bay SAV Study Area.

Section 1. Susquehanna Flats - all areas between and including Spesutie Island and Turkey Point at the mouth of the Elk River to include the Northeast River.

Section 2. Upper Eastern Shore - all areas in the Elk, Bohemia, and Sassafras rivers, and areas on the eastern shore above the Swan Point quadrangle.

Section 3. Upper Western Shore - all areas south of Spesutie Island and north of the Chesapeake Bay Bridge to include the Bush, Gunpowder, Middle, Patapsco, and Magothy rivers.

Section 4. Chester River - includes all of the Chester River, Eastern Neck, and areas north of the Chesapeake Bay Bridge on Kent Island extending to north of Swan Point.

Section 5. Central Western Shore - all areas south of the Chesapeake Bay Bridge and north of Holland Point on Herring Bay to include the Severn, Rhode, South, and West rivers and Herring Bay.

Section 6. Eastern Bay - all areas south of the Chesapeake Bay Bridge on Kent Island and north of Tilghman Island from Green Marsh Point to include the Wye, East, and Miles rivers, Crab Alley and Prospect bays, and Poplar, Jefferson, and Coaches islands.

Section 7. Choptank River - all areas south of Tilghman Island from Green Marsh Point and north of Taylor Island to include the Choptank and Little Choptank rivers.

Section 8. Patuxent River - all areas in the Patuxent River.

Section 9. Middle Western Shore - all areas south of Holland Point at Herring Bay and north of Point Lookout on the Potomac River not including the mouth of the Patuxent River.

(continue on next page)

TABLE 3 (continued)

Section 10. Lower Potomac River - all areas between the mouth of the Potomac River to a line extending from Maryland Point on the north shore, just above Nanjemoy Creek, to Somersett Beach on the south shore.

Section 11. Upper Potomac River - all areas upstream of the Lower Potomac River Section to Chain Bridge at Washington D.C.

Section 12.** Middle Eastern Shore - all areas south of Taylor Island and north of a line bisecting Cedar Island to include the Big and Little Annemessex, Honga, Nanticoke, Wicomico, and Manokin rivers, and Fishing Bay.

Section 13.** Mid-Bay Island Complex - all areas in and adjacent to Bloodsworth, South Marsh, Smith, and Tangier islands.

Section 14.** Lower Eastern Shore - all areas south of a line bisecting Cedar Island and located just above the Maryland-Virginia border to Fisherman's Island.

Section 15. Reedville Region - includes the area between Windmill Point on the Rappahannock River and Smith Point at the mouth of the Potomac River.

Section 16. Rappahannock River Complex - includes the entire Rappahannock and Piankatank rivers, and the Milford Haven area.

Section 17. New Point Comfort Region - includes the area from New Point Comfort Lighthouse north to Garden Creek just south of Milford Haven.

Section 18.** Mobjack Bay Complex - includes the East, North, Ware, and Severn rivers, the north shore of Mobjack Bay from New Point Comfort Lighthouse to the North River, and north of a line bisecting the large shoal area around the Guinea Marshes.

(continue on next page)

TABLE 3 (concluded)

Section 19.**	York River - all areas of the York River from north of the Poropotank River to the mouth, including south of a line bisecting the large shoal area around the Guinea Marshes and the north shore of Goodwin Island.
Section 20.**	Lower Western Shore - includes all areas south of Goodwin Island to Lynnhaven Inlet, including Broad Bay but not including the James River.
Section 21.	James River - all areas in the James River including the Chickahominy River.

** Sections 12, 13, 14, 18, 19, and 20 were given new boundaries for the 1987 report (Orth et al., 1989) which also changed the delineation of the three zones. These new boundaries were retained for the 1989, 1990, 1991, and 1992 reports (Orth and Nowak, 1990; Orth et al., 1991; Orth et al., 1992, Orth et al., 1993) and for this report. (Refer to Figure 7 and Appendix B for boundary locations.)

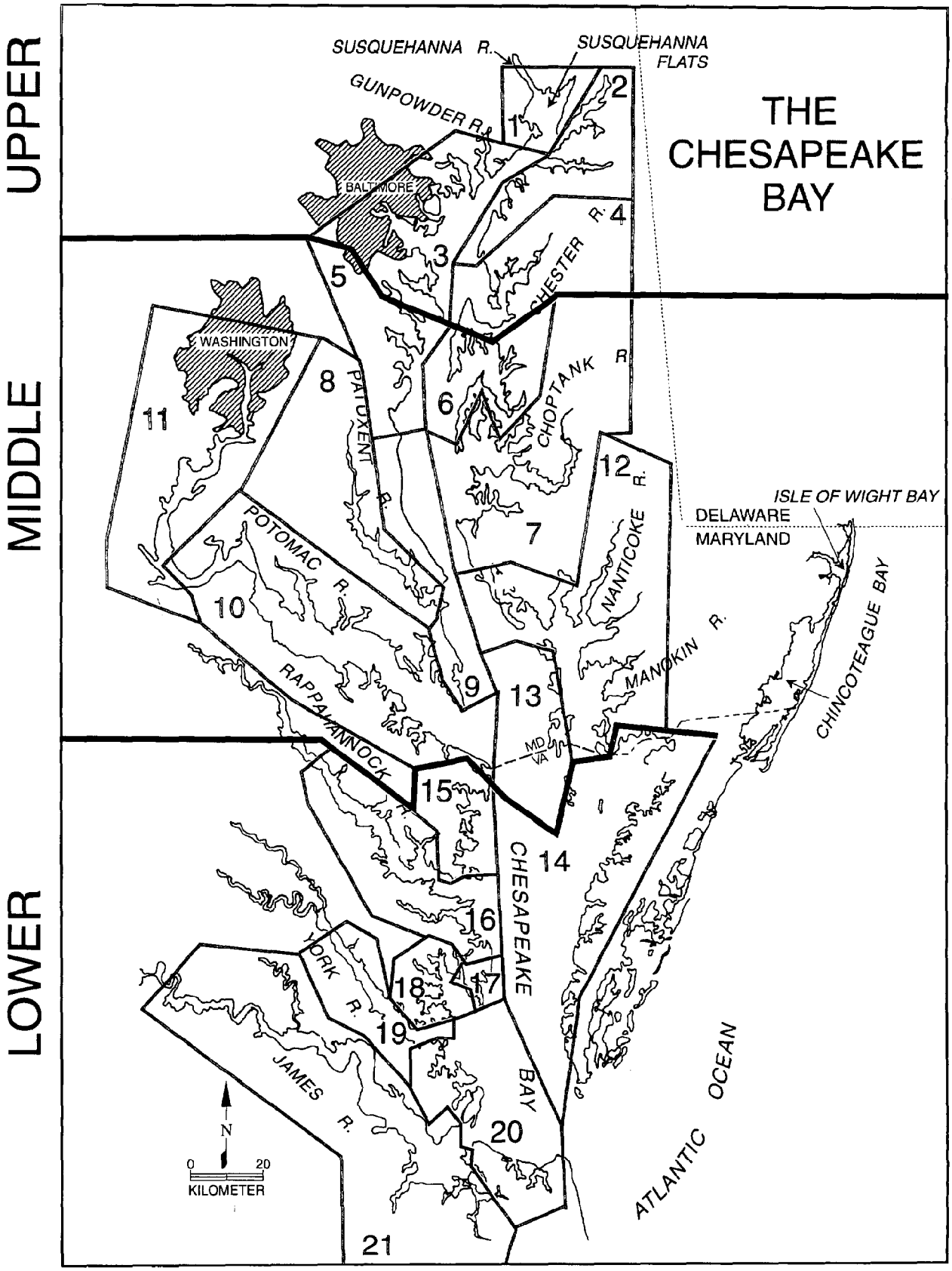

Figure 7. Location of Chincoteague Bay and Chesapeake Bay with Upper, Middle, and Lower zones and 21 sections used for delineation of SAV distribution patterns. (See Table 3 and Appendix B for exact boundary positions.)

The salinity within each zone roughly coincides with the major salinity zones of estuaries: polyhaline (18-25 °/oo), Lower zone; mesohaline (5-18 °/oo), Middle zone; oligohaline (0.5-5 °/oo), Upper zone. Although the major rivers and smaller tributaries of Chesapeake Bay have their own salinity regimes, the distribution of SAV in each river is discussed within the zone where it connects to the bay.

In addition, 21 sections of the bay are identified (Figure 7, Table 3) for a more detailed discussion of SAV distribution. These sections, which were first delineated for the 1984 SAV survey (Orth et al., 1985) and slightly modified for the 1987 SAV survey (Orth et al., 1989), denote relatively distinct parts of Chesapeake Bay and its tributaries that are readily identifiable. The section boundaries used for analysis and discussion of the 1993 SAV distribution and abundance data were used for the 1987, 1989, 1990, 1991 and 1992 reports (Orth et al., 1989; Orth and Nowak, 1990, Orth et al., 1991, Orth et al., 1992, Orth et al., 1993). Sections 1 through 4 are located in the Upper Bay zone; sections 5 through 13 are in the Middle Bay zone; and sections 14 through 21 are in the Lower Bay zone. SAV distribution in Chincoteague Bay is presented and discussed separately from Chesapeake Bay. Appendix B gives the latitude and longitude, in decimal degrees, of the boundary points of each Chesapeake Bay section and of Chincoteague Bay.

GROUND SURVEYS AND OTHER DATA BASES

Ground surveys were accomplished by cooperative efforts from a number of agencies and individuals. Although not all areas of the bay were surveyed, the data did provide valuable supplemental information. The surveys confirmed the existence of some SAV beds mapped from the 1993 aerial photography, as well as SAV beds not visible from the photography. The surveys also provided species data for many of the SAV beds. Ground survey information supplied to VIMS researchers was included on the SAV distribution and abundance maps reproduced in Appendix C. Each survey was designated by a unique symbol to identify the different methods of sampling. In most cases the symbols on the SAV maps (Appendix C) have been enlarged and offset from the actual sampling point to avoid confusion with the mapped SAV bed. Where species information was available, it was included on the map. Because of space limitations on the maps reproduced in Appendix C, occasionally one or more survey points were combined where the information was duplicated. All ground survey data supplied to VIMS are tabulated in Appendix E.

In Maryland, ground survey data were obtained in 1993 by VIMS, the USGS National Center, U.S. Fish and Wildlife Service, Patuxent River Park staff, and by the Citizens' volunteer survey. The USFWS contributed ground survey data for the Magothy and Chester rivers. The USGS National Center provided ground truth data for the Potomac River. Patuxent River ground survey data were obtained by the Maryland-National Capital Parks and Planning Commission Patuxent River Park staff. The Citizens' volunteer survey, under the guidance of the USFWS and the Chesapeake Bay Foundation (CBF), identified SAV locations and SAV species when possible throughout various areas of the Chesapeake and Chincoteague bays. Volunteers, who were recruited through press releases, newsletters, and personal letters, were provided with a SAV identification guide, reduced 1992 SAV maps to aid in the location of SAV beds, and data sheets for reporting visits to numerous sites around the bays. USFWS staff mapped the data on copies of 1992 SAV distribution maps (USGS 7.5 minute quads with 1992 SAV beds). These maps were supplied to VIMS SAV researchers and transferred to the 1993 SAV distribution maps reproduced in Appendix C. Data from the USFWS, Patuxent River Park staff, and the Citizens' surveys were compiled and tabulated by USFWS. This table became the basis of the much expanded table published in Appendix E.

One 1993 SAV project being conducted on the Susquehanna Flats by Stan Kollar of Harford Community College, Maryland, provided data in the form of species presence by percentage.

For those areas in Virginia waters where aerial photographic evidence of SAV beds was inconclusive, photoverification was accomplished by ground truth surveys. Observations were principally made from small boats and by divers snorkeling over areas indicated from the photographs. In the York, Piankatank, and Rappahannock rivers, where VIMS researchers had transplanted SAV (principally eelgrass), transplant sites were also examined carefully by divers for any extant SAV. VIMS

scientists also surveyed a number of sites in the Chesapeake Bay as part of an intensive quantitative SAV study (VIMS, unpublished data). Data for Virginia waters were also collected by the Citizens' volunteer survey (compiled by the USFWS). In addition, a great deal of ground survey information could be extrapolated from earlier studies (Orth et al., 1979; Orth and Moore, 1982). SAV beds in the lower bay contain primarily one or two species and most areas have not undergone wide fluctuations in distribution and abundance since the first bay-wide survey in 1978.

Ground survey data from all sources reported here were added to the USFWS table and each SAV siting was cross-referenced with its associated 1993 SAV bed location. This expanded ground survey table is presented in Appendix E.

RESULTS

DATA PRESENTATION

SAV distribution data are presented by quadrangle (Table 4), by section and zone (Table 5), by quadrangles within a section (Table 6), and by density class for each section (Table 7). Quadrangle maps annotated with all SAV beds are presented in Appendix C, while individual bed areas for each quadrangle are given in Appendix D. Appendix E tabulates all ground truth data for 1993. The 1993 SAV distribution data and species occurrences are first discussed relative to the Upper, Middle, and Lower Bay zones. The 21 sections of the Chesapeake Bay, and Chincoteague Bay, are then discussed individually, and the data compared to results from the 1992 survey of SAV distribution and abundance (Orth, et al., 1993). SAV is plotted for each section and for Chincoteague Bay in Figures 8 through 36. SAV beds are plotted in red, and bold, black lines represent section boundaries. USGS 7.5 minute quadrangles are represented by a grid of numbered rectangles (refer to Table 2 for quadrangle names listed by map number). Specific names of rivers, creeks, or points of land which are not found on the section plots, are on the quadrangle maps for that section.

1993 SUMMARY

In 1993, the Chesapeake Bay had 29,589 hectares of SAV, compared to 28,591 hectares in 1992, with 2,700 hectares (9.0%), 13,901 hectares (47.0%), and 13,018 hectares (44.0%) occurring in the Upper, Middle, and Lower Bay zones, respectively (Figures 1, 2, and 3). SAV generally increased in each of the three zones from 1992. Decreases in some sections (e.g. Mid-Bay Island Complex, Upper Eastern Shore, and Western Shore) were offset by larger increases in other sections (e.g. Choptank River, Eastern Bay, and Chester River sections). SAV increased in abundance in all sections in the Lower Bay zone.

Upper Bay Zone

In 1993, in the Upper Bay zone, 66.5% (1,777 hectares) of the SAV was located in the Susquehanna Flats (Section 1). Overall abundance and density of SAV was similar to the 1992 level (1,792 hectares). In the Flats, 85.4% of all SAV beds were classified as very sparse in 1993 (0-10% coverage), while 7.7% of beds were classified as dense (70-100% coverage) (Table 7; Figure 3). *Myriophyllum spicatum*, *Heteranthera dubia*, *V. americana*, *H. verticillata*, *C. demersum*, and *N. guadalupensis* were the six species reported. In the Upper Eastern Shore (Section 2) there were 184 hectares of SAV in 1993 (99 hectares less than in 1992) located principally in the Elk and lower Sassafras rivers, with *M. spicatum* and *V. americana* found most frequently, especially in the Elk River. Much of the difference from 1992 in the Upper Eastern Shore section was recorded from the

TABLE 4

Total Area of SAV in Hectares by USGS 7.5 Minute Quadrangles for 1992 and 1993.

QUADRANGLE	1992	1993
001. Conowingo Dam, Md.-Pa.	0	0
002. Aberdeen, Md.	14.98	8.21
003. Havre de Grace, Md.	1,745.68	1,734.74
004. North East, Md.	126.21	46.18
005. Elkton, Md.-Del.	0	0
006. White Marsh, Md.	0	0
007. Edgewood, Md.	.43	0
008. Perryman, Md.	8.78	8.03
009. Spesutie, Md.	45.08	46.32
010. Earleville, Md.	116.16	53.43
011. Cecilton, Md.	0	0
012. Baltimore East,Md.	0	0
013. Middle River, Md.	16.07	5.47
014. Gunpowder Neck, Md.	155.87	47.81
015. Hanesville, Md.	26.19	4.24
016. Betterton, Md.	2.47	68.99
017. Galena, Md.	2.98	4.48
018. Curtis Bay, Md.	0	0
019. Sparrows Point, Md.	#	0
020. Swan Point, Md.	5.39	17.62
021. Rock Hall, Md.	12.34	32.63
022. Chestertown, Md.	0	0
023. Round Bay, Md.	#	#
024. Gibson Island, Md.	#	13.21
025. Love Point, Md.	0	0
026. Langford Creek, Md.	220.66	518.08
027. Centreville, Md.	0	0
028. Washington West, Md.-D.C.	9.92	25.22
029. Washington East, D.C.-Md.	0	.75
030. South River, Md.	#	#
031. Annapolis, Md.	0	#
032. Kent Island, Md.	69.59	154.37
033. Queenstown, Md.	87.40	181.41

(continue on next page)

TABLE 4 (continued)

QUADRANGLE	1992	1993
034. Alexandria, Va.-D.C.-Md.	318.29	336.46
035. Deale, Md.	#	0
036. Claiborne, Md.	231.64	426.61
037. St. Michaels, Md.	243.63	270.70
038. Easton, Md.	0	0
039. Fort Belvoir, Va.-Md.	133.72	111.39
040. Mt. Vernon, Va.-Md.	254.57	236.45
041. Lower Marlboro, Md.	#	8.78
042. North Beach, Md.	0	0
043. Tilghman, Md.	222.47	393.98
044. Oxford, Md.	115.79	444.33
045. Trappe, Md.	0	#
046. Preston, Md.	#	0
047. Quantico, Va.-Md.	594.92	599.93
048. Indian Head, Md.- Va.	336.04	346.05
049. Benedict, Md.	0	#
050. Prince Frederick, Md.	-	-
051. Hudson, Md.	515.96	567.35
052. Church Creek, Md.	105.79	149.08
053. Cambridge, Md.	5.66	4.02
054. East New Market, Md.	0	0
055. Widewater, Va.-Md.	730.95	623.44
056. Nanjemoy, Md.	168.32	89.01
057. Mathias Point, Md.-Va.	292.05	252.84
058. Popes Creek, Md.	1.30	1.52
059. Mechanicsville, Md.	0	0
060. Broomes Island, Md.	#	#
061. Cove Point, Md.	#	#
062. Taylors Island, Md.	62.39	100.19
063. Golden Hill, Md.	29.23	65.10
064. Passapatanzy, Md.-Va.	12.24	6.60
065. King George, Va.-Md.	74.45	79.07
066. Dahlgren, Va.-Md.	33.98	28.57
067. Colonial Beach North, Va.	47.76	49.80
068. Rock Point, Md.	0	#

(continue on next page)

TABLE 4 (continued)

QUADRANGLE	1992	1993
069. Leonardtown, Md.	0	0
070. Hollywood, Md.	0	#
071. Solomons Island, Md.	#	.99
072. Barren Island, Md.	433.61	205.83
073. Honga, Md.	1,326.88	1,340.42
074. Wingate, Md.	480.81	540.89
075. Nanticoke, Md.	0	0
076. Colonial Beach South, Va.	0	#
077. Stratford Hall, Va.-Md.	0	0
078. St. Clements Island, Va.	#	#
079. Piney Point, Md.-Va.	0	0
080. St. Mary's City, Md.	8.81	12.26
081. Point No Point, Md.	-	-
082. Richland Point, Md.	45.90	41.06
083. Bloodsworth Island, Md.	1,024.10	863.08
084. Deal Island, Md.	68.75	77.09
085. Monie, Md.	0	7.09
086. Champlain, Va.	-	-
087. Machodoc, Va.	0	0
088. Kinsale, Va.-Md.	0	0
089. St. George Island, Md.-Va	3.08	4.26
090. Point Lookout, Md.	0	0
091. Kedges Straits, Md.	971.21	903.44
092. Terrapin Sand Point, Md.	267.81	231.38
093. Marion, Md.	278.43	293.94
094. Mount Landing, Va	-	-
095. Tappahannock, Va	-	-
096. Lottsburg, Va.	0	0
097. Heathsville, Va.-Md.	0	0
098. Burgess, Va.-Md.	#	0
099. Ewell, Md.-Va.	2,543.16	2,376.65
100. Great Fox Island, Md.-Va.	1,504.94	1,483.11
101. Crisfield, Md.-Va.	321.69	339.28
102. Saxis, Va.-Md.	2.86	2.10
103. Dunnsville, Va.	-	-

(continue on next page)

TABLE 4 (continued)

QUADRANGLE	1992	1993
104. Morattico, Va.	0	0
105. Lively, Va.	0	0
106. Reedville, Va.	302.51	304.16
107. Tangier Island, Va.	601.73	571.70
108. Chesconessex, Va.	1,042.80	1,103.95
109. Parksley, Va.	461.99	510.57
110. Urbanna, Va.	11.25	0
111. Irvington, Va.	165.60	159.94
112. Fleets Bay, Va.	475.89	508.92
113. Nandua Creek, Va.	473.91	467.61
114. Pungoteague, Va.	949.27	1,008.32
115. West Point, Va.	-	-
116. Saluda, Va.	0	0
117. Wilton, Va.	18.18	44.09
118. Deltaville, Va.	142.86	216.84
119. Jamesville, Va.	634.02	683.82
120. Toano, Va.	-	-
121. Gressitt, Va.	-	-
122. Ware Neck, Va.	318.37	313.09
123. Mathews, Va.	326.70	395.88
124. Franktown, Va.	718.67	767.84
125. Westover, Va.	-	-
126. Charles City, Va.	-	-
127. Brandon, Va.	-	-
128. Norge, Va.	-	-
129. Williamsburg, Va.	-	-
130. Clay Bank, Va.	#	0
131. Achilles, Va	1,040.46	1,057.83
132. New Point Comfort, Va.	1,486.00	1,503.15
133. Cape Charles, Va.	361.03	465.78
134. Cheriton, Va.	87.25	96.82
135. Savedge, Va.	-	-
136. Claremont, Va.	-	-
137. Surry, Va.	-	-

(continue on next page)

TABLE 4 (continued)

QUADRANGLE	1992	1993
138. Hog Island, Va.	-	-
139. Yorktown, Va.	1.16	2.52
140. Poquoson West, Va.	582.94	618.48
141. Poquoson East, Va.	1,161.06	1,181.72
142. Elliotts Creek, Va.	111.96	113.63
143. Townsend, Va.	0	-
144. Bacons Castle, Va.	-	-
145. Mulberry Island, Va.	-	-
146. Newport News North, Va.	-	-
147. Hampton, Va.	380.63	366.99
148. Benns Church, Va.	-	-
149. Newport News South, Va.	-	0
150. Norfolk North, Va.	-	-
151. Little Creek, Va.	0	0
152. Cape Henry, Va.	19.55	21.22
153. Chuckatuck, Va.	-	-
154. Bowers Hill, Va.	-	-
155. Norfolk South, Va.	-	-
156. Kempsville, Va.	-	-
157. Princess Anne, Va.	0	-
158. Wye Mills, Md.	0	0
159. Bristol, Md.	#	#
160. Fowling Creek, Md.	0	-
161. Port Tobacco, Md.	12.60	12.21
162. Charlotte Hall, Md.	0	4.60
163. Mardela Springs, Md.	0	0
164. Wetipquin, Md.	0	0
165. Selbyville, Md.	0	0
166. Assawoman Bay, Md.	7.94	20.35
167. Berlin, Md.	10.69	15.36
168. Ocean City, Md.	23.57	33.06
169. Public Landing, Md.	0	0
170. Tingles Island, Md.	1,180.30	1,189.95
171. Girdle Tree, Md.-Va.	0	0

(continue on next page)

TABLE 4 (concluded)

QUADRANGLE	1992	1993
172. Boxiron, Md.-Va.	771.61	817.41
173. Whittington Point, Md.-Va	399.10	451.65
174. Chincoteague West, Va.	6.27	13.92
175. Chincoteague East, Va.	924.70	1,034.71
176. Anacostia, D.C.-Md.	0	0
177. East of New Point Comfort, Va.	8.67	18.55
178. Bethel Beach, Va.	0*	5.75
179. Goose Island, Va.	214.79	177.38
TOTAL SAV - Chesapeake Bay	28,591.23	29,588.68
TOTAL SAV - Chincoteaque Bay	3,324.18	3,576.42

- = Indicates quadrangle not photographed and assumed to have no SAV.
0 = Indicates quadrangle photographed and no SAV noted.
0* = This quadrangle was newly published and was not available to this year's mapping. SAV beds located on this quadrangle were mapped on the overlapping portion of the adjoining quadrangle.
= SAV detected by ground truthing only.

Table 5

Number of Hectares of SAV in 1992 and 1993 for the 21 Sections and Three Zones of Chesapeake Bay and for Chincoteague Bay.

ZONE	SECTION	AREA (HECTARES) 1992	1993
	1. Susquehanna Flats	1,791.97	1,776.52
Upper	2. Upper Eastern Shore	282.96	184.46
	3. Upper Western Shore	185.97	80.13
	4. Chester River	255.16	628.82
	Zone Total	2,516.06	2,669.93
	5. Central Western Shore	0.00	0.00
	6. Eastern Bay	553.93	737.25
	7. Choptank River	1,085.39	1,894.30
	8. Patuxent River	0.00	9.77
Middle	9. Middle Western Shore	0.00	0.00
	10. Lower Potomac River	571.03	457.78
	11. Upper Potomac River	2,461.96	2,362.65
	12. Middle Eastern Shore	3,046.93	2,972.14
	13. Mid-Bay Island Complex	5,993.93	5,466.78
	Zone Total	13,713.17	13,900.67
	14. Lower Eastern Shore	5,920.17	6,298.94
	15. Reedville	778.40	813.09
	16. Rappahannock River Complex	586.84	722.18
Lower	17. New Point Comfort Region	395.91	430.94
	18. Mobjack Bay Complex	1,818.03	1,842.66
	19. York River	830.08	840.62
	20. Lower Western Shore	2,029.07	2,065.64
	21. James River	3.50	4.01
	Zone Total	12,362.00	13,018.08
Total SAV for Chesapeake Bay		28,591.23	29,588.68
Total SAV for Chincoteague Bay		3,324.18	3,576.42

TABLE 6

Number of Square Meters of SAV in 1993 for Each USGS 7.5 Minute Quadrangle of the 21 Sections of Chesapeake Bay and of Chincoteague Bay. (Map Code Numbers from Table 2 in Parentheses.)

SECTION	QUADRANGLE	AREA
Susquehanna Flats - 1	Conowingo Dam, Md.-Pa. (1)	0.00
	Aberdeen, Md. (2)	82,134.82
	Havre de Grace, Md. (3)	17,347,404.14
	North East, Md. (4)	0.00
	Elkton, Md.-Del. (5)	0.00
	Perryman (8)	11,748.72
	Spesutie, Md. (9)	323,927.89
	Earleville, Md. (10)	0.00
		17 ,765,216 sq. m
		1,776.52 hectares
		4,389.79 acres
Upper Eastern Shore - 2	North East, Md. (4)	461,782.17
	Elkton, Md.-Del. (5)	0.00
	Perryman, Md. (8)	0.00
	Spesutie, Md. (9)	71,319.88
	Earleville, Md. (10)	534,344.23
	Cecilton, Md. (11)	0.00
	Gunpowder Neck, Md. (14)	0.00
	Hanesville, Md. (15)	42,409.63
	Betterton, Md. (16)	689,938.61
	Galena, Md. (17)	44,811.70
	Swan Point, Md. (20)	0.00
	Rock Hall, Md. (21)	0.00
	Chestertown, Md. (22)	0.00
		1,844,606 sq. m
		184.46 hectares
		455.80 acres
Upper Western Shore - 3	White Marsh, Md. (6)	0.00

(continue on next page)

Table 6 (continued)

SECTION	QUADRANGLE	AREA
Upper Western Shore - 3 (continued)	Edgewood (7)	0.00
	Perryman, Md. (8)	68,574.17
	Spesutie, Md. (9)	67,955.40
	Baltimore East, Md. (12)	0.00
	Middle River, Md. (13)	54,652.32
	Gunpowder Neck, Md. (14)	478,077.09
	Hanesville, Md. (15)	0.00
	Curtis Bay, Md. (18)	0.00
	Sparrows Point, Md. (19)	0.00
	Swan Point, Md. (20)	0.00
	Round Bay, Md. (23)	0.00
	Gibson Island, Md. (24)	132,052.85
	Love Point, Md. (25)	0.00
		801,312 sq. m
		80.13 hectares
		198.00 acres
Chester River - 4	Betterton, Md. (16)	0.00
	Galena, Md. (17)	0.00
	Swan Point, Md. (20)	176,178.84
	Rock Hall, Md. (21)	326,330.99
	Chestertown, Md. (22)	0.00
	Love Point, Md. (25)	0.00
	Langford Creek, Md. (26)	5,180,752.93
	Centreville, Md. (27)	0.00
	Kent Island, Md. (32)	0.00
	Queenstown, Md. (33)	604,969.92
		6,288,233 sq.
		628.82 hectares
		1,553.82 acres
Central Western Shore -5	Curtis Bay, Md. (18)	0.00
	Round Bay, Md. (23)	0.00
	Gibson Island, Md. (24)	0.00
	Love Point, Md. (25)	0.00

(continue on next page)

Table 6 (continued)

SECTION	QUADRANGLE	AREA
Central Western Shore -5 (continued)	South River, Md. (30)	0.00
	Annapolis, Md. (31)	0.00
	Kent Island, Md. (32)	0.00
	Deale, Md. (35)	0.00
	North Beach, Md. (42)	0.00
		0.00 sq. m
		0.00 hectares
		0.00 acres
Eastern Bay - 6	Centreville, Md. (27)	0.00
	Annapolis, Md. (31)	0.00
	Kent Island, Md. (32)	1,543,673.84
	Queenstown, Md. (33)	1,209,126.25
	Claiborne, Md. (36)	2,842,965.13
	St. Michaels, Md. (37)	1,776,699.18
	Easton, Md. (38)	0.00
	Tilghman, Md. (43)	0.00
	Oxford, Md. (44)	0.00
	Wye Mills, Md. (158)	0.00
		7,372,464 sq. m
		737.25 hectares
		1,821.74 acres
Choptank River - 7	Centreville, Md. (27)	0.00
	Claiborne, Md. (36)	1,423,106.87
	St. Michaels, Md. (37)	930,320.53
	Easton, Md. (38)	0.00
	Tilghman, Md. (43)	3,939,834.99
	Oxford, Md. (44)	4,443,327.36
	Trappe, Md. (45)	0.00
	Preston, Md. (46)	0.00
	Hudson, Md. (51)	5,673,502.74
	Church Creek, Md. (52)	1,490,785.18
	Cambridge, Md. (53)	40,219.67
	East New Market, Md. (54)	0.00

(continue on next page)

Table 6 (continued)

SECTION	QUADRANGLE	AREA
Choptank River 7- (continued)	Taylors Island, Md. (62)	1,001,937.99
	Golden Hill, Md. (63)	0.00
	Nanticoke, Md. (75)	0.00
	Wye Mills, Md. (158)	0.00
	Fowling Creek, Md. (160)	0.00
		18,943,035 sq. m
		1,894.30 hectares
		4,680.83 acres
Patuxent River - 8	Deale, Md. (35)	0.00
	Lower Marlboro, Md. (41)	87,761.58
	North Beach, Md. (42)	0.00
	Benedict, Md. (49)	0.00
	Prince Frederick, Md. (50)	0.00
	Mechanicsville, Md. (59)	0.00
	Broomes Island, Md. (60)	0.00
	Cove Point, Md. (61)	0.00
	Leonardtown, Md. (69)	0.00
	Hollywood, Md. (70)	0.00
	Solomons Island, Md. (71)	9,946.00
	Bristol, Md. (159)	0.00
	Charlotte Hall, Md. (162)	0.00
		97,708 sq. m
		9.77 hectares
		24.14 acres
Middle Western Shore - 9	North Beach, Md. (42)	0.00
	Prince Frederick, Md. (50)	0.00
	Hudson, Md. (51)	0.00
	Broomes Island, Md. (60)	0.00
	Cove Point, Md. (61)	0.00
	Taylors Island, Md. (62)	0.00
	Solomons Island, Md. (71)	0.00
	Barren Island, Md. (72)	0.00
	St. Mary's City, Md. (80)	0.00

(continue on next page)

Table 6 (continued)

SECTION	QUADRANGLE	AREA
Middle Western Shore -9 (continued)	Point No Point, Md. (81)	0.00
	Richland Point, Md. (82)	0.00
	Point Lookout, Md. (90)	0.00
		0.00 sq. m
		0.00 hectares
		0.00 acres
Lower Potomac River - 10	Nanjemoy, Md. (56)	890,060.10
	Mathias Point, Md.-Va. (57)	2,528,396.64
	Popes Creek, Md. (58)	15,239.88
	Mechanicsville, Md. (59)	0.00
	King George, Va.-Md. (65)	149,134.80
	Dahlgren, Va.-Md. (66)	285,711.40
	Colonial Beach North, Va.-Md. (67)	498,035.53
	Rock Point, Md. (68)	0.00
	Leonardtown, Md. (69)	0.00
	Hollywood, Md. (70)	0.00
	Solomons Island, Md. (71)	00.0
	Colonial Beach South, Va.-Md. (76)	0.00
	Stratford Hall, Va.-Md. (77)	0.00
	St. Clements Island, Va.-Md. (78)	0.00
	Piney Point, Md.-Va. (79)	0.00
	St. Mary's City, Md. (80)	122,586.69
	Champlain, Va. (86)	0.00
	Machodoc, Va. (87)	0.00
	Kinsale, Va.-Md. (88)	0.00
	St. George Island, Md.-Va. (89)	42,625.36
	Point Lookout, Md. (90)	0.00
	Lottsburg, Va. (96)	0.00
	Heathsville, Va.-Md. (97)	0.00
	Burgess, Va.-Md. (98)	0.00
	Port Tobacco, Md. (161)	0.00
	Charlotte Hall, Md. (162)	46,044.19
		4,577,835 sq. m
		457.78 hectares
		1,131.18 acres

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Table 6 (continued)

SECTION	QUADRANGLE	AREA
Upper Potomac River - 11	Washington West, Md.-D.C.-Va. (28)	252,155.37
	Washington East, D.C.-Md. (29)	7,488.02
	Alexandria, VA.-D.C.-Md. (34)	3,364,573.07
	Fort Belvoir, Va.-Md. (39)	1,113,940.17
	Mt. Vernon, Va.-Md. (40)	2,364,516.42
	Quantico, Va.-Md. (47)	5,999,269.62
	Indian Head, Md.- Va. (48)	3,460,515.00
	Widewater, Va.-Md. (55)	6,234,426.54
	Nanjemoy, Md. (56)	0.00
	Mathias Point, Md.-Va. (57)	0.00
	Passapatanzy, Md.-Va. (64)	65,977.47
	King George, Va.-Md. (65)	641,543.50
	Dahlgren, Va.-Md. (66)	0.00
	Port Tobacco, Md. (161)	122,124.20
	Anacostia, D.C.-Md. (176)	0.00
		23,626,529 sq. m
		2,362.65 hectares
		5,838.11 acres
Middle Eastern Shore - 12	Taylors Island, Md. (62)	0.00
	Golden Hill, Md. (63)	651,001.82
	Barren Island, Md. (72)	2,058,286.91
	Honga, Md. (73)	13,404,228.15
	Wingate, Md. (74)	5,408,853.95
	Nanticoke, Md. (75)	0.00
	Point No Point, Md. (81)	0.00
	Richland Point, Md. (82)	410,643.94
	Bloodsworth Island, Md. (83)	1,251,669.10
	Deal Island, Md. (84)	770,886.55
	Monie, Md. (85)	70,868.46
	Terrapin Sand Point, Md. (92)	200,625.97
	Marion, Md. (93)	2,939,413.35
	Great Fox Island, Md.-Va. (100)	1,406,547.54
	Crisfield, Md.-Va. (101)	1,148,377.60
	Mardela Springs, Md. (163)	0.00

(continue on next page)

Table 6 (continued)

SECTION	QUADRANGLE	AREA
Middle Eastern Shore - 12 (continued)	Wetipquin, Md. (164)	0.00
		29,721,403 sq. m
		2,972.14 hectares
		7,344.17 acres
Mid-Bay Island Complex -13	Richland Point, Md. (82)	0.00
	Bloodsworth Island, Md. (83)	7,379,138.35
	Deal Island, Md. (84)	0.00
	Kedges Straits, Md. (91)	9,034,396.14
	Terrapin Sand Point, Md. (92)	2,113,131.00
	Ewell, Md.-Va. (99)	23,766,456.38
	Great Fox Island, Md.-Va. (100)	5,474,556.40
	Tangier Island, Va. (107)	5,126,283.11
	Goose Island, Va. (179)	1,773,825.53
		54,667,787 sq. m
		5,466.78 hectares
		13,508.43 acres
Lower Eastern Shore - 14	Marion, Md. (93)	0.00
	Great Fox Island, Md.-Va. (100)	7,949,953.33
	Crisfield, Md.-Va. (101)	2,244,394.61
	Saxis, Va.-Md. (102)	20,989.38
	Tangier Island, Va. (107)	590,668.70
	Chesconessex, Va. (108)	11,039,547.00
	Parksley, Va. (109)	5,105,724.52
	Nandua Creek, Va. (113)	4,676,076.81
	Pungoteague, Va. (114)	10,083,156.89
	Jamesville, Va. (119)	6,838,222.73
	Franktown, Va. (124)	7,678,398.81
	Cape Charles, Va. (133)	4,657,806.42
	Cheriton, Va. (134)	968,198.06
	Elliotts Creek, Va. (142)	1,136,293.00
	Townsend, Va. (143)	0.00

(continue on next page)

Table 6 (continued)

SECTION	QUADRANGLE	AREA
Lower Eastern Shore - 14 (continued)	Bethel Beach, Va. (178)	0.00
	Goose Island, Va. (179)	0.00
		62,989,430 sq. m
		6,298.94 hectares
		15,564.71 acres
Reedville - 15	Heathsville, Va.-Md. (97)	0.00
	Burgess, Va.-Md. (98)	0.00
	Reedville, Va. (106)	3,041,640.81
	Irvington, Va. (111)	0.00
	Fleets Bay, Va. (112)	5,089,223.06
		8,130,864 sq. m
		813.09 hectares
		2,009.14 acres
Rappahannock River Complex-16	Tappahannock, Va. (95)	0.00
	Lottsburg, Va. (96)	0.00
	Dunnsville, Va. (103)	0.00
	Morattico, Va. (104)	0.00
	Lively, Va. (105)	0.00
	Urbanna, Va. (110)	0.00
	Irvington, Va. (111)	1,599,377.92
	Fleets Bay, Va. (112)	0.00
	Saluda, Va. (116)	0.00
	Wilton, Va. (117)	440,866.91
	Deltaville, Va. (118)	2,168,355.10
	Ware Neck, Va. (122)	0.00
	Mathews, Va. (123)	3,013,170.75
	Bethel Beach, Va. (178)	0.00
		7,221,771 sq. m
		722.18 hectares
		1,784.50 acres
New Point Comfort Region-17	Mathews, Va. (123)	452,846.11
	New Point Comfort, Va. (132)	3,613,518.43

(continue on next page)

Table 6 (continued)

SECTION	QUADRANGLE	AREA
New Point Comfort Region-17 (continued)	East of New Point Comfort, Va. (177)	185,546.84
	Bethel Beach, Va. (178)	57,536.15
		4,309,448 sq. m
		430.94 hectares
		1,784.50 acres
Mobjack Bay Complex - 18	Ware Neck, Va. (122)	3,130,936.59
	Mathews, Va. (123)	492,775.91
	Clay Bank, Va. (130)	0.00
	Achilles, Va. (131)	7,269,886.02
	New Point Comfort, Va. (132)	7,533,040.90
	East of New Point Comfort, Va. (177)	0.00
		18,426,639 sq. m
		1,842.66 hectares
		4,553.23 acres
York River - 19	Toano, Va. (120)	0.00
	Gressitt, Va. (121)	0.00
	Norge, Va. (128)	0.00
	Williamsburg, Va. (129)	0.00
	Clay Bank, Va. (130)	0.00
	Achilles, Va. (131)	3,308,452.38
	New Point Comfort, Va. (132)	3,884,983.60
	Hog Island, Va. (138)	0.00
	Yorktown, Va. (139)	25,171.89
	Poquoson West, Va. (140)	1,187,626.25
	Poquoson East, Va. (141)	0.00
	East of New Point Comfort, Va. (177)	0.00
		8,406,234 sq. m
		840.62 hectares
		2,077.18 acres
Lower Western Shore - 20	New Point Comfort, Va. (132)	0.00
	Poquoson West, Va. (140)	4,997,149.37
	Poquoson East, Va. (141)	11,817,200.31

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Table 6 (continued)

SECTION	QUADRANGLE	AREA
Lower Western Shore - 20 (continued)	Elliotts Creek, Va. (142)	0.00
	Newport News North, Va. (146)	0.00
	Hampton, Va. (147)	3,629,859.80
	Norfolk North, Va. (150)	0.00
	Little Creek, Va. (151)	0.00
	Cape Henry, Va. (152)	212,198.16
	Kempsville, Va. (156)	0.00
	Princess Anne, Va. (157)	0.00
		20,656,408 sq. m
		2,065.64 hectares
		5,104.20 acres
James River - 21	Toano, Va. (120)	0.00
	Westover, Va. (125)	0.00
	Charles City, Va. (126)	0.00
	Brandon, Va. (127)	0.00
	Norge, Va. (128)	0.00
	Williamsburg, Va. (129)	0.00
	Savedge, Va. (135)	0.00
	Claremont, Va. (136)	0.00
	Surry, Va. (137)	0.00
	Hog Island, Va. (138)	0.00
	Yorktown, Va. (139)	0.00
	Poquoson West, Va. (140)	0.00
	Bacons Castle, Va. (144)	0.00
	Mulberry Island, Va. (145)	0.00
	Newport News North, Va. (146)	0.00
	Hampton, Va. (147)	40,070.48
	Benns Church, Va. (148)	0.00
	Newport News South, Va. (149)	0.00
	Norfolk North, Va. (150)	0.00
	Little Creek, Va. (151)	0.00
	Chuckatuck, Va. (153)	0.00
	Bowers Hill, Va. (154)	0.00
	Norfolk South, Va. (155)	0.00

(continue on next page)

Table 6 (continued)

SECTION	QUADRANGLE	AREA
James River - 21 (continued)	Kempsville, Va. (156)	0.00
	Princess Anne, Va. (157)	0.00
		40,070 sq. m
		4.01 hectares
		9.90 acres
Chincoteague Bay	Selbyville, Md. (165)	0.00
	Assawoman Bay, Md. (166)	203,549.50
	Berlin, Md. (167)	153,620.34
	Ocean City, Md. (168)	330,609.61
	Public Landing, Md. (169)	0.00
	Tingles Island, Md. (170)	11,899,515.33
	Girdle Tree, Md.-Va. (171)	0.00
	Boxiron, Md.-Va. (172)	8,174,132.56
	Whittington Point, Md.-Va. (173)	4,516,484.63
	Chincoteague West, Va. (174)	139,216.00
	Chincoteague East, Va. (175)	10,347,097.87
		35,764,226 sq. m
		3,576.42 hectares
		8,837.35 acres

TABLE 7

Number of Square Meters of SAV in 1993 by Density Class for the 21 Sections of Chesapeake Bay and for Chincoteague Bay.

SECTION	DENSITY	AREA
Susquehanna Flats - 1	Density 1 =	15,177,640
	Density 2 =	752,937
	Density 3 =	459,625
	Density 4 =	1,375,014
	Total =	17,765,216
Upper Eastern Shore - 2	Density 1 =	1,174,501
	Density 2 =	320,802
	Density 3 =	310,376
	Density 4 =	38,927
	Total =	1,844,606
Upper Western Shore - 3	Density 1 =	35,905
	Density 2 =	498,326
	Density 3 =	255,228
	Density 4 =	11,853
	Total =	801,312
Chester River - 4	Density 1 =	889,735
	Density 2 =	1,360,136
	Density 3 =	2,225,875
	Density 4 =	1,812,486
	Total =	6,288,233
Central Western Shore - 5	Density 1 =	0
	Density 2 =	0
	Density 3 =	0
	Density 4 =	0
	Total =	0

(continue on next page)

TABLE 7 (continued)

SECTION	DENSITY	AREA
Eastern Bay - 6		
	Density 1 =	5,076,125
	Density 2 =	868,454
	Density 3 =	1,262,423
	Density 4 =	165,461
	Total =	7,372,464
Choptank River - 7		
	Density 1 =	3,472,813
	Density 2 =	11,201,823
	Density 3 =	3,638,963
	Density 4 =	629,437
	Total =	18,943,035
Patuxent River - 8		
	Density 1 =	0
	Density 2 =	87,762
	Density 3 =	9,946
	Density 4 =	0
	Total =	97,708
Middle Western Shore - 9		
	Density 1 =	0
	Density 2 =	0
	Density 3 =	0
	Density 4 =	0
	Total =	0
Lower Potomac River - 10		
	Density 1 =	92,763
	Density 2 =	1,145,772
	Density 3 =	949,431
	Density 4 =	2,389,869
	Total =	4,577,835

(continue on next page)

TABLE 7 (continued)

SECTION	DENSITY	AREA
Upper Potomac River - 11		
	Density 1 =	866,513
	Density 2 =	1,210,694
	Density 3 =	2,432,213
	Density 4 =	19,117,110
	Total =	23,626,529
Middle Eastern Shore - 12		
	Density 1 =	1,601,573
	Density 2 =	12,122,352
	Density 3 =	10,763,700
	Density 4 =	5,233,779
	Total =	29,721,403
Mid-Bay Island Complex - 13		
	Density 1 =	4,066,298
	Density 2 =	30,316,627
	Density 3 =	8,222,103
	Density 4 =	12,062,759
	Total =	54,667,787
Lower Eastern Shore - 14		
	Density 1 =	6,862,250
	Density 2 =	24,730,537
	Density 3 =	10,047,774
	Density 4 =	21,348,869
	Total =	62,989,430
Reedville - 15		
	Density 1 =	1,265,825
	Density 2 =	3,429,209
	Density 3 =	1,803,367
	Density 4 =	1,632,463
	Total =	8,130,864

(continue on next page)

TABLE 7 (continued)

SECTION	DENSITY	AREA
Rappahannock River Complex - 16		
	Density 1 =	667,773
	Density 2 =	4,365,164
	Density 3 =	1,612,282
	Density 4 =	576,552
	Total =	7,221,771
New Point Comfort Region - 17		
	Density 1 =	335,391
	Density 2 =	797,929
	Density 3 =	2,472,834
	Density 4 =	703,293
	Total =	4,309,448
Mobjack Bay Complex - 18		
	Density 1 =	765,006
	Density 2 =	2,944,854
	Density 3 =	1,799,849
	Density 4 =	12,916,931
	Total =	18,426,639
York River - 19		
	Density 1 =	137,881
	Density 2 =	1,351,683
	Density 3 =	0
	Density 4 =	6,916,671
	Total =	8,406,234
Lower Western Shore - 20		
	Density 1 =	3,009,730
	Density 2 =	2,875,213
	Density 3 =	5,685,864
	Density 4 =	9,085,600
	Total =	20,656,408

(continue on next page)

TABLE 7 (concluded)

SECTION	DENSITY	AREA
James River - 21		
	Density 1 =	0
	Density 2 =	0
	Density 3 =	40,070
	Density 4 =	0
	Total =	40,070
Chincoteague Bay		
	Density 1 =	936,199
	Density 2 =	9,415,315
	Density 3 =	6,046,968
	Density 4 =	19,365,744
	Total =	35,764,226
Chesapeake Bay Total		
	Density 1 =	45,497,719
	Density 2 =	100,374,417
	Density 3 =	53,954,745
	Density 4	96,052,946
	Total =	295,879,827

Elk River. The Upper Western Shore (Section 3) had 80 hectares of SAV compared to 186 hectares recorded in 1992. SAV was reported from the Gunpowder River area including Dundee Creek; the lower Spesutie Narrows; the Middle and Magothy rivers; and Romney and Delph creeks. SAV was noticeably reduced in Saltpeter Creek from 1992 and was absent from Seneca Creek in 1993. SAV was mapped in the Magothy River for the first time since it was last reported in 1978. *Myriophyllum spicatum*, *E. canadensis*, and *Z. palustris* were frequently cited. In the Chester River (Section 4) SAV abundance (629 hectares) was up 374 hectares from 1992. SAV was most abundant adjacent to Eastern Neck, Eastern Neck Island, and in the lower Chester River. *Ruppia maritima* was most commonly cited.

Middle Bay Zone

In 1993, 39.3% (5,467 hectares) of the SAV in the Middle Bay zone was found in the Mid-Bay Island Complex (Section 13) which includes the broad shoal area between Smith and Tangier Islands. This is a decrease of 527 hectares over 1992. In this zone, 21.4% (2972 hectares) of the SAV was present in the Middle Eastern Shore (Section 12), primarily in the Barren Island-Honga River area; the Big and Little Annemessex rivers; and the lower section of the Manokin River, with *R. maritima* reported most frequently. SAV was much less abundant in the Barren Island area. No SAV was mapped from the Central Western Shore (Section 5) and Middle Western Shore (Section 9). SAV in the Patuxent River (Section 8) increased from 0 hectares in 1992 to 10 hectares in 1993. Citizens' surveys reported *Z. palustris* and *R. maritima* at numerous locations in the South and Severn rivers. Eleven species were reported in the Patuxent River.

The Middle Bay zone also includes the entire Potomac River, where 2,820 hectares of SAV were present in 1993. SAV was concentrated in two distinct regions: 1) the Upper Potomac River (Section 11) with 2,363 hectares; and 2) the upper portion of the Lower Potomac River (Section 10) with 458 hectares, including Nanjemoy Creek and Port Tobacco River. Although the total abundance of SAV in the Upper Potomac section decreased from 1992 by 99 hectares, there was a notable increase in SAV in the Alexandria quadrangle. In particular, a large shoal area in the middle Potomac River, just above the large bed around the Woodrow Wilson Bridge, which had been previously unvegetated, supported sparse SAV for the first time since this survey was initiated. Ground truth data was reported by USGS and Citizens' surveys with 9 species reported: *M. spicatum, V. americana, H. verticillata, H. dubia, C. demersum, Najas minor, P. pectinatus, P. crispus,* and *N. guadalupensis.* SAV in the lower Potomac River also decreased (113 hectares) in 1993. Ground truth data was reported by Citizens' and VIMS surveys with 4 species cited: *Z. palustris, P. crispus, R. maritima,* and *M. spicatum.* SAV continued to increase in the Eastern Bay and Choptank River sections from 1992. SAV in the Eastern Bay (Section 6) increased 183 hectares from 1992 to a total of 737 hectares in 1993, while in the Choptank River (Section 7) it increased 809 hectares from 1992 to a total of 1,894 hectares in 1993. Most of the increase in the Eastern Bay occurred in Cox Creek, Crab Alley Bay, around Parson Island, and Piney Neck Point. In the Choptank River section, SAV

beds were most abundant in Harris and Broad creeks and in Trippe Bay. Two species were reported from Section 6, with *R. maritima* most commonly cited. Three species were reported from Section 7, with *R. maritima* most commonly cited.

Lower Bay Zone

Distribution and abundance of SAV in 1993, in the Lower Bay zone, were similar to 1992. In this zone, 48.4% (6,299 hectares) of the SAV was found in the Lower Eastern Shore (Section 14) around the Fox, Cedar, Webb, and Halfmoon islands; and the mouths of major creeks (i.e. Cherrystone Inlet; Hungars, Mattawoman, Nassawadox, Occohannock, Craddock, Pungoteague, Nandua, and Onancock creeks; and Beasley Bay). Along the western shore of the Chesapeake Bay, SAV was abundant in Mobjack Bay (Section 18) (14.2% of SAV in the Lower Bay zone), in the lower York River (Section 19) (6.5% of SAV in the Lower Bay zone), and in the Lower Western Shore (Section 20), specifically Back River and the Drum Island Flats area adjacent to Plum Tree Island (15.9% of SAV in the Lower Bay zone). Sparse SAV was documented for a segment of the south shore of the York River, downstream from Yorktown, for the first time in over twenty years (Orth and Gordon, 1975). There were 813 hectares of SAV mapped in the Reedville Region (Section 15) in 1993, a 4.5% increase over 1992. There were 431 hectares of SAV identified in 1993 in the New Point Comfort Region (Section 17), compared to 396 hectares in 1992. SAV abundance was up 23.1% from 1992 in both the Piankatank and Rappahannock rivers (Section 16). The James River (Section 21) had 4 hectares of SAV in 1993. *Zostera marina* and *R. maritima* were the abundant species in this zone.

Chincoteague Bay

SAV in the Chincoteague Bay section increased in distribution with 3,576 hectares mapped in 1993 compared to 3,324 hectares in 1992. Most of the SAV in Chincoteague and Sinepuxent bays, which consisted mainly of *Z. marina* and *R. maritima*, was located along the eastern side of the bay behind Assateague Island. Some small beds, consisting mainly of *R. maritima*, were located along the eastern side of Isle of Wight and Assawoman bays.

DISCUSSION OF SECTIONS ARRANGED WITHIN ZONES

Upper Bay Zone

1. Susquehanna Flats

There were 1,777 hectares of SAV in the Susquehanna Flats section in 1993 (Tables 4-7; Figure 8; Appendix C, Maps 2, 3, 8 and 9), compared to 1,792 hectares mapped in 1992. In this section 7.7% of the total coverage of SAV in this section was dense (class 4), 2.6% was moderate (class 3), 4.2% was sparse (class 2), and 85.4% was very sparse (class 1) (Table 7; Figure 3). SAV beds were located principally in two main areas: 1) sparse to dense fringing beds in the Susquehanna River consisting primarily of *M. spicatum*, with *H. dubia*, *V. americana*, *H. verticillata*, and *C. demersum* from Robert Island to the river mouth at Havre de Grace on the west side, to Stump Point at the mouth of Mill Creek on the east side, and in Mill Creek, Furnace Bay, Baker Cove, and at High Point; and 2) a large area of very sparse SAV located in the broad shoal area at the river mouth. This broad shoal area continues to consist of small patches of *M. spicatum*. Additionally, the Citizens' survey reported *H. verticillata*. In addition, SAV beds were again mapped in Spesutie Narrows where most SAV is found as small, fringing beds of *M. spicatum* and *H. verticillata*.

A total of six species (*M. spicatum*, *H. dubia*, *V. americana*, *H. verticillata*, *C. demersum*, *N. guadalupensis*) have been reported on Maps 2, 3, and 9 (Appendix C), either by Stan Kollar of Harford Community College or the Citizens' Survey.

2. Upper Eastern Shore

There were 184 hectares of SAV mapped for the Upper Eastern Shore section in 1993 (Tables 4-7; Figure 9; Appendix C, Maps 4, 9, 10, 15, 16, and 17), compared to 283 hectares mapped for 1992. In this section 2.1% of the total coverage of SAV was dense (class 4), 16.8% was moderate (class 3), 17.4% was sparse (class 2), and 63.7% was very sparse (class 1) (Table 7; Figure 3). Principal locations of beds were in the Elk River and the lower Sassafras River. Very little SAV was mapped in the Bohemia River or along the mainstem of the bay from Still Pond to Swan Point. Much of the decrease was recorded in the Elk River. Ground survey data from Stan Kollar and the Citizens' survey reported 5 species in this section (Appendix C, Maps 4, 9, 10, 16, and 17), with *M. spicatum* and *V. americana* found most frequently. *Heteranthera dubia*, *P. crispus*, *P. pectinatus*, and an unidentified species were also reported in the Elk River.

3. Upper Western Shore

There were 80 hectares of SAV mapped from the aerial photographs in 1993 for the Upper Western

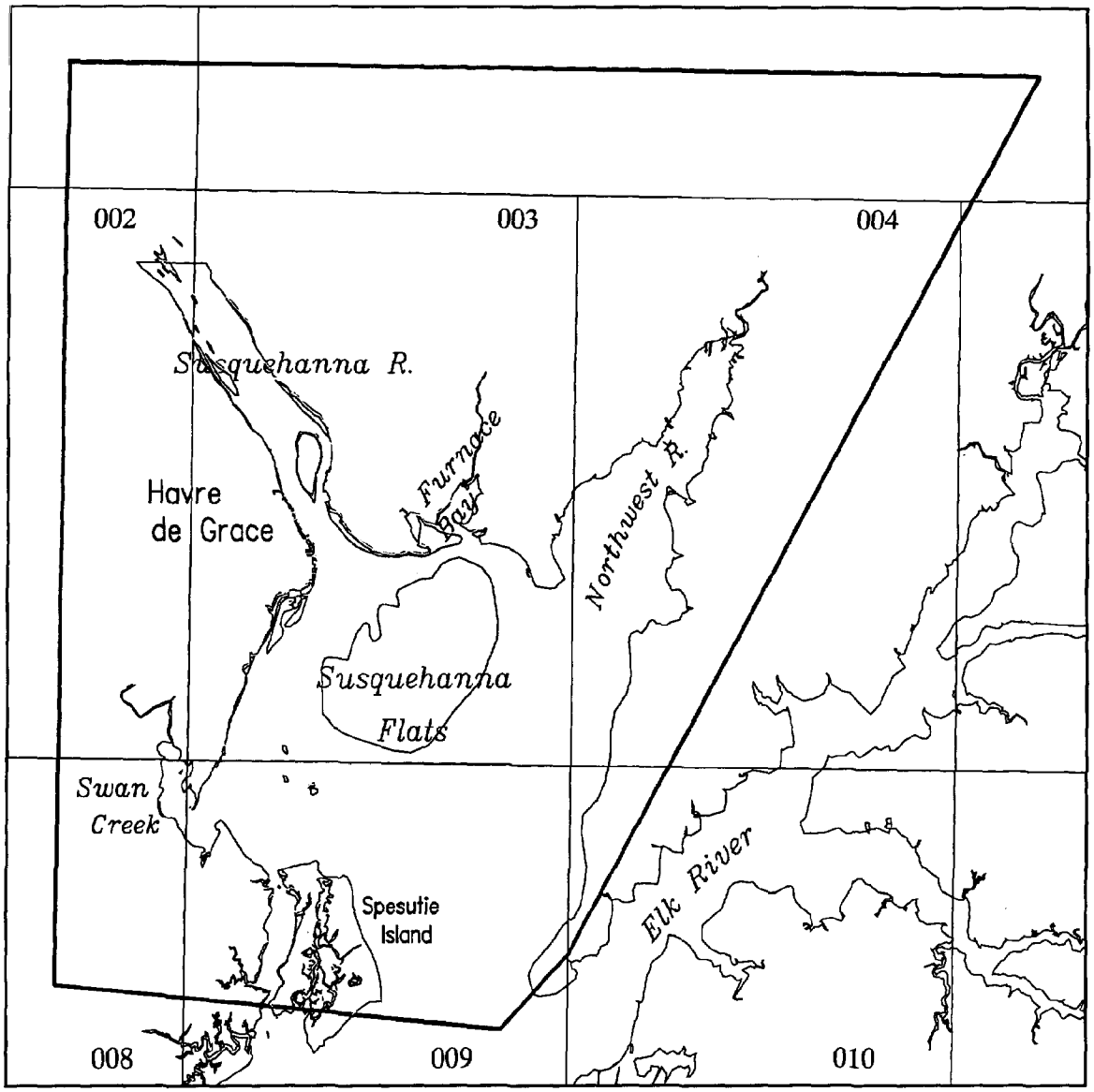

Figure 8. Distribution of SAV in the Susquehanna Flats (Section 1) in 1993.

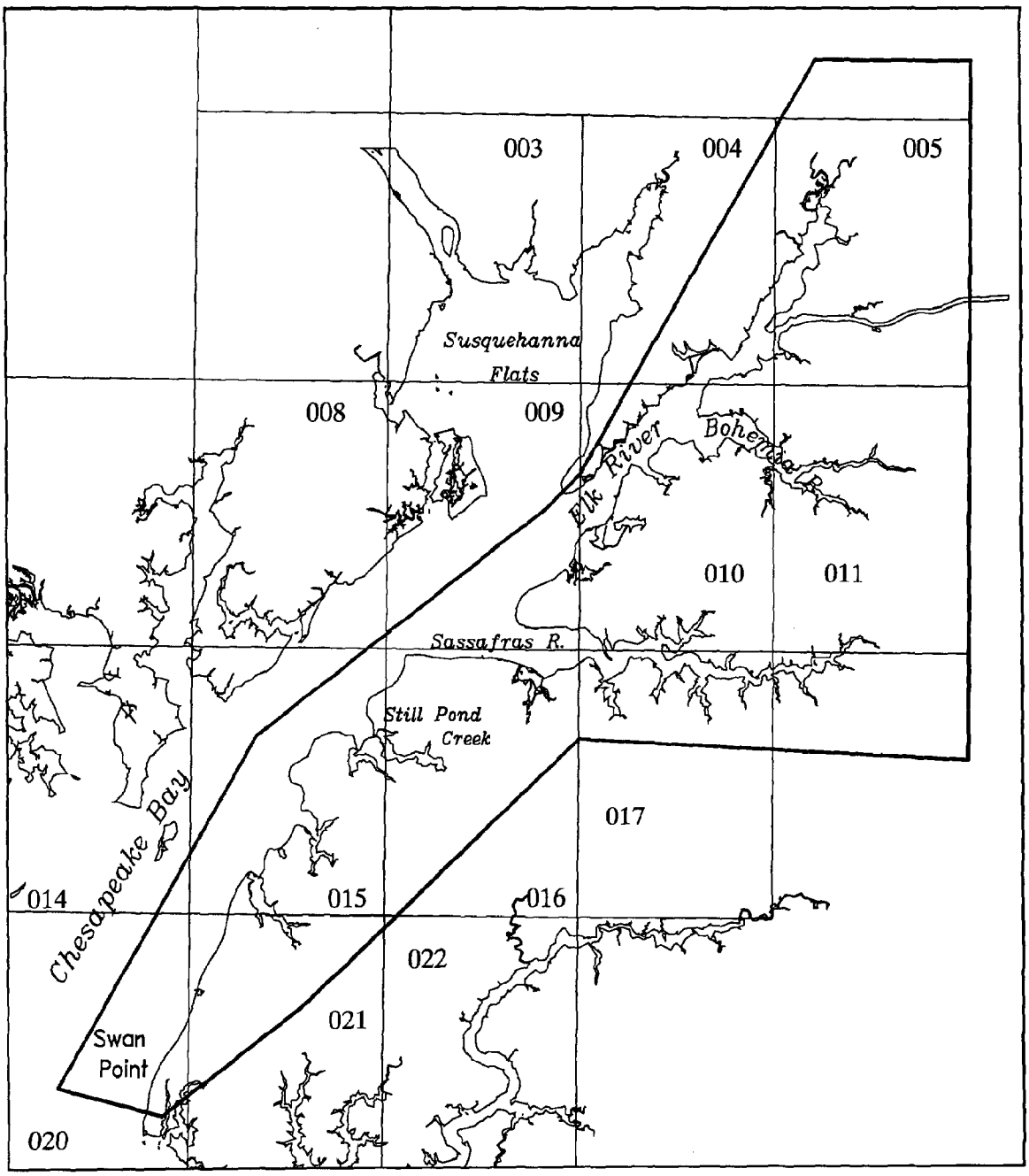

Figure 9. Distribution of SAV in the Upper Eastern Shore (Section 2) in 1993.

Shore section (Tables 4-7; Figure 10; Appendix C, Maps 8, 9, 13, 14, and 24), compared to 186 hectares in 1992. Of the total coverage of SAV in this section 1.5% was dense (class 4), 31.9% was moderate (class 3), and 62.2% was sparse (class 2), and 4.5% was very sparse (Table 7; Figure 3). SAV beds were located in Romney, Little Romney, and Delph creeks, the lower Spesutie Narrows, the Gunpowder River area, including Dundee Creek, and the Magothy and Middle rivers. SAV was noticeably reduced in Saltpeter Creek and was absent in Seneca Creek. SAV was mapped for the first time in the Magothy River since 1978. As in 1992, no SAV was reported in the Back, Patapsco, and Bush rivers.

Ground survey data from the Citizens' survey and the U.S. Fish and Wildlife Service reported 11 species in this section (Appendix C, Maps 9, 13, 14, 23, and 24). *Myriophyllum spicatum, E. canadensis,* and *Z. palustris* were found most frequently. *Vallisneria americana, P. crispus, P. pectinatus, P. perfoliatus, R. maritima, Najas flexilis, Najas* spp., and *C. demersum* were reported less frequently.

4. **Chester River**

There were 629 hectares of SAV in the Chester River section in 1993 (Tables 4-7; Figure 11; Appendix C, Maps 20, 21, 26, and 33), compared to 255 hectares in 1992. In this section, 28.8% of the total coverage of SAV was dense (class 4), 35.4% was moderate (class 3), 21.6% was sparse (class 2), and 14.1% was very sparse (class 1) (Table 7; Figure 3). This is a notable increase since 1991, when only 57 hectares were reported. Most of the SAV, and where the greatest increase occurred, was located adjacent to Eastern Neck and Eastern Neck Island, especially near Eastern Neck Narrows; in Grays Inn, Langford, and Queenstown creeks, tributaries entering the Chester River. Rock Hall Harbor; the Haven; and Swan, Langford, and Huntingfield creeks, located above Eastern Neck on the Chesapeake Bay, supported the remaining SAV beds in this section. Eight species of SAV were reported from this section by Citizens', U.S. Fish and Wildlife Service, and VIMS surveys in 1993: *Potamogeton perfoliatus, Z. palustris, R. maritima, M. spicatum, C. demersum, E. canadensis, N.* spp., and *N. flexilis* (Appendix C, Maps 26 and 33).

Middle Bay Zone

5. **Central Western Shore**

There was no SAV observed from the aerial photography in the Central Western Shore section in 1993 (Tables 4-7; Figure 12). This was the same as 1992. Citizens' surveys found *Z. palustris* and *R. maritima* at numerous locations in the Severn and South rivers (Appendix C, Maps 30 and 31) as well as *Potamogeton pusillus* at Lake Ogleton.

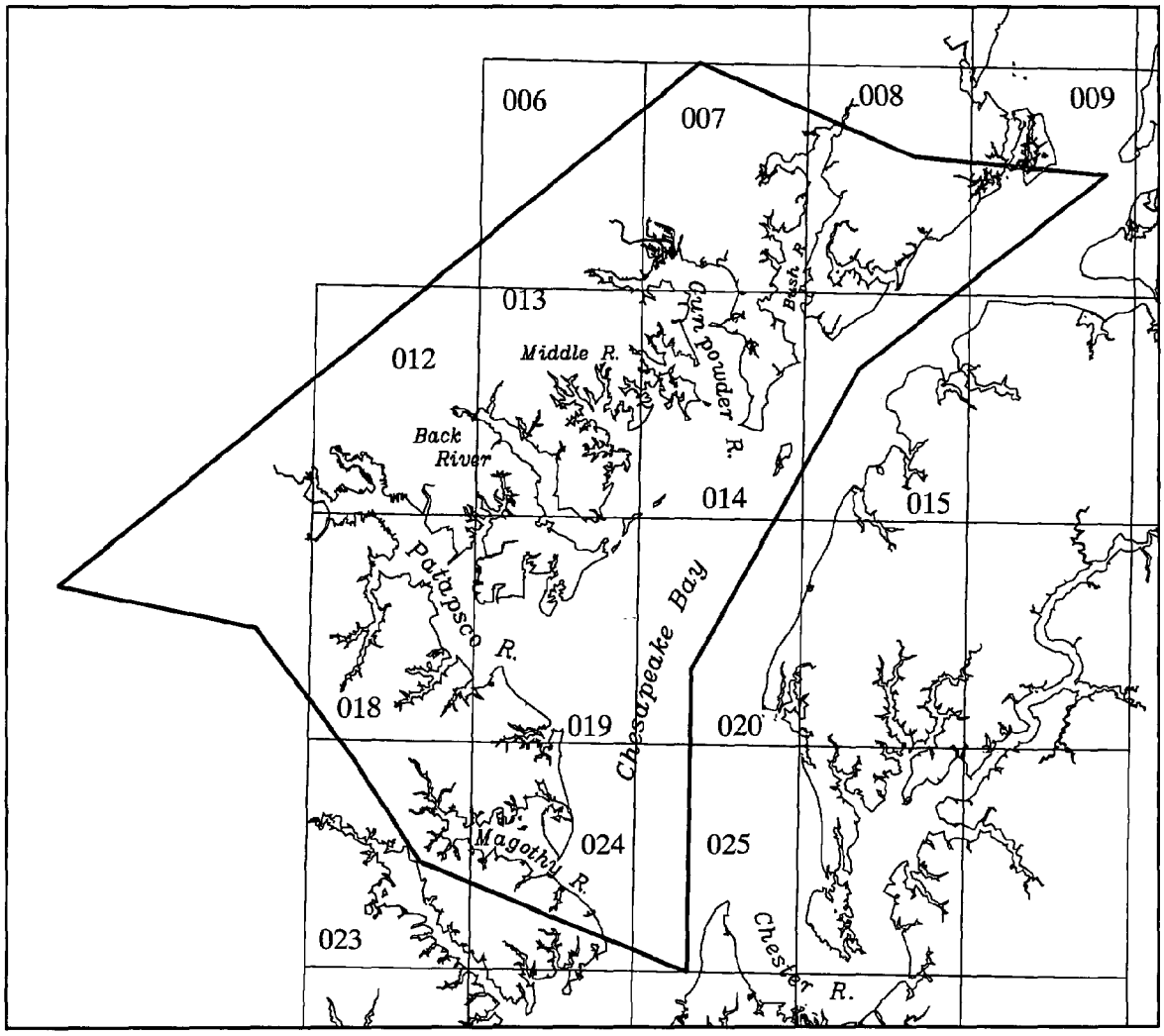

Figure 10. Distribution of SAV in the Upper Western Shore (Section 3) in 1993.

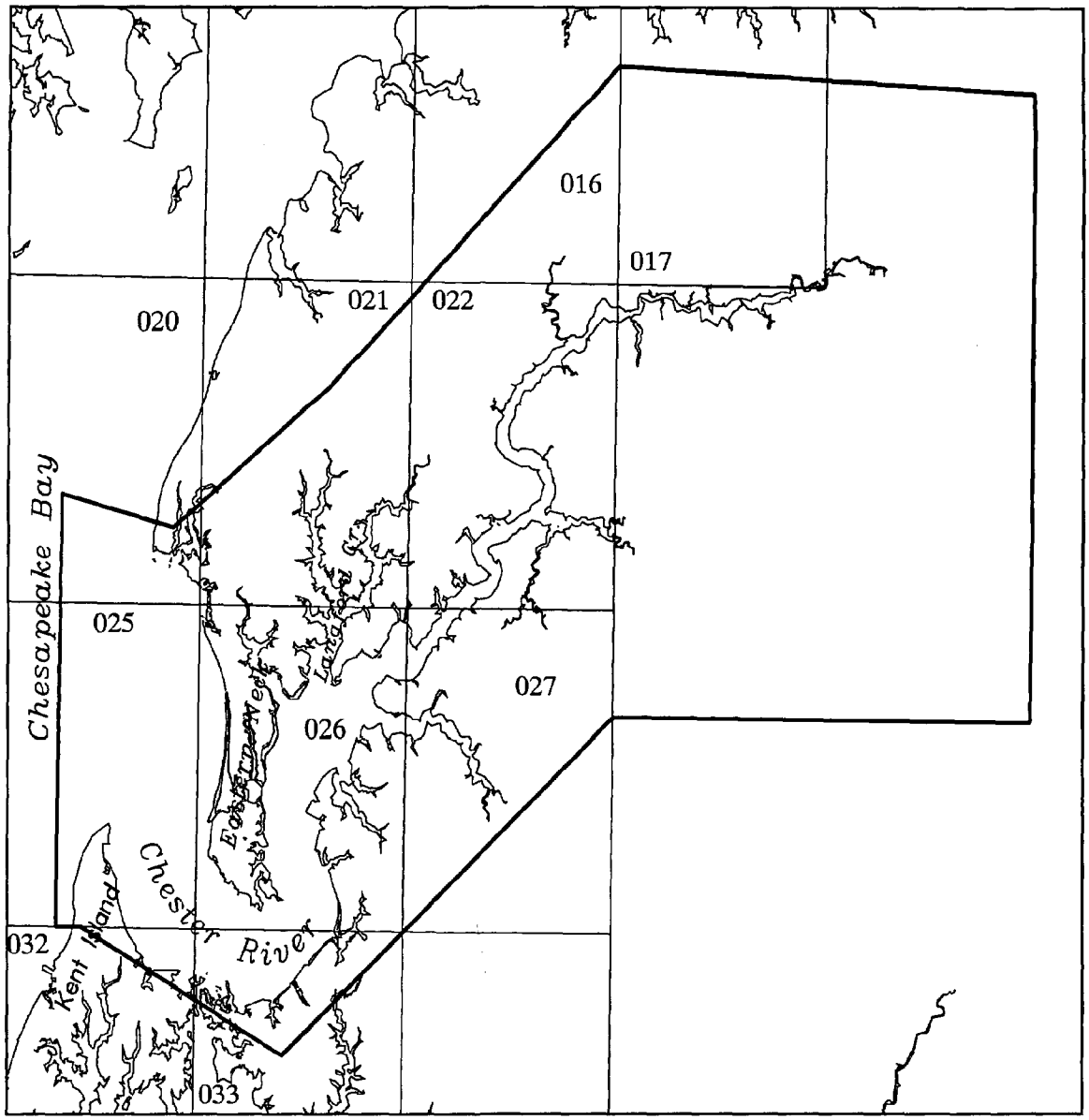

Figure 11. Distribution of SAV in the Chester River (Section 4) in 1993.

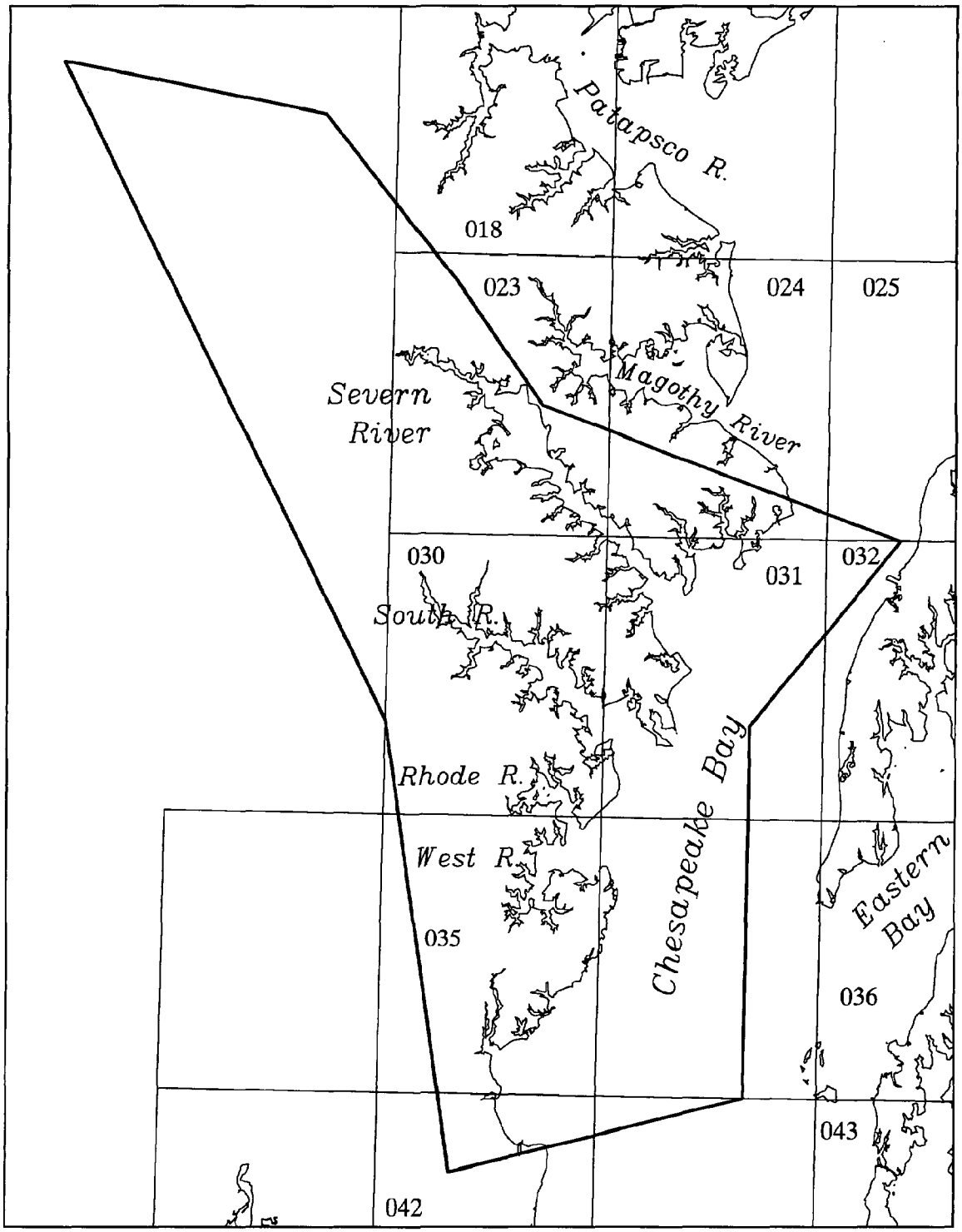

Figure 12. Distribution of SAV in the Central Western Shore (Section 5) in 1993.

6. **Eastern Bay**

There were 737 hectares of SAV identified from the Eastern Bay section in 1993 (Tables 4-7; Figure 13; Appendix C, Maps 32, 33, 36, and 37), compared to 554 hectares reported in 1992, a 33.1% increase. This is the second year in a row that SAV has increased in this area. Only 68 hectares were reported in 1991. In this section, 2.2% of the total coverage of SAV in this section was dense (class 4), 17.1% was moderate (class 3), 11.8% was sparse (class 2), and 68.9% was very sparse (class 1) (Table 7; Figure 3). Most of the SAV was found in the lower Miles River; the lower Cox Creek; Wye River; the eastern shore of lower Kent Island; Parson Island; Harbor Cove on Eastern Bay; Piney Neck; Crab Alley Bay; and between Harbor Cove and Tilghman Point on Eastern Bay. Only two species of SAV were reported from this section by Citizens' and VIMS surveys: *Z. palustris* and *R. maritima,* (Appendix C, Maps 32, 33, and 36) with *R. maritima* most commonly cited.

7. **Choptank River**

There were 1894 hectares of SAV observed in the Choptank River section in 1993 (Tables 4-7; Figures 14 and 15; Appendix C, Maps 36, 37, 43, 44, 51, 52, 53, and 62), compared to 1085 hectares in 1992. This was an increase of 74.5%. In this section, 3.3% of the total coverage of SAV was dense (class 4), 19.2% was moderate (class 3), 59.1% was sparse (class 2), and 18.3% was very sparse (class 1) (Table 7; Figure 3). In the Choptank River, SAV was found in moderate to sparse beds in Blackwalnut Cove at the southern tip of Tilghman Island: Harris, Broad, San Domingo, Edge, Irish, and Chapel creeks; the Tred Avon River; Dickinson Bay; and Castle Haven Point. Moderate to sparse beds were also found in Trippe Bay; the lower Choptank River, including James Island, Hills Point; Oyster, Cators, and Hooper coves; and Slaughter, Brooks, Hudson, and Back creeks.

Three species of SAV were reported from this section by Citizens' and VIMS surveys: *Z. palustris, R. maritima, P. perfoliatus,* and an unidentified species (Appendix C, Maps 36, 37, 43, 44, 51, 52, and 53) with *R. maritima* most commonly cited.

8. **Patuxent River**

There were 10 hectares of SAV observed in 1993 in the Patuxent River section (Tables 4-7; Figures 16 and 17, Appendix C, Maps 41 and 71), compared to zero hectares in 1992. One bed was located in the upper Patuxent River where many of the Citizens' reports were located, while a second bed was noted at the mouth of the river between Solomons Island and Drum Point. In this section, 10.2% of the total coverage was moderate (class 3), while 89.8% was sparse (class 2). A total of eleven species were reported in this section. The Citizens' survey reported ten species occurring primarily in the marsh creeks in the upper portions of the Patuxent River (Appendix C, Maps 41, 49, and 159): *E. canadensis, C. demersum, V. americana, Z. palustris, N. guadalupensis, N. minor, P. crispus, P. pusillus, H. verticillata,* and *Potamogeton epihydrus. Zannichellia palustris* and *R. maritima* were

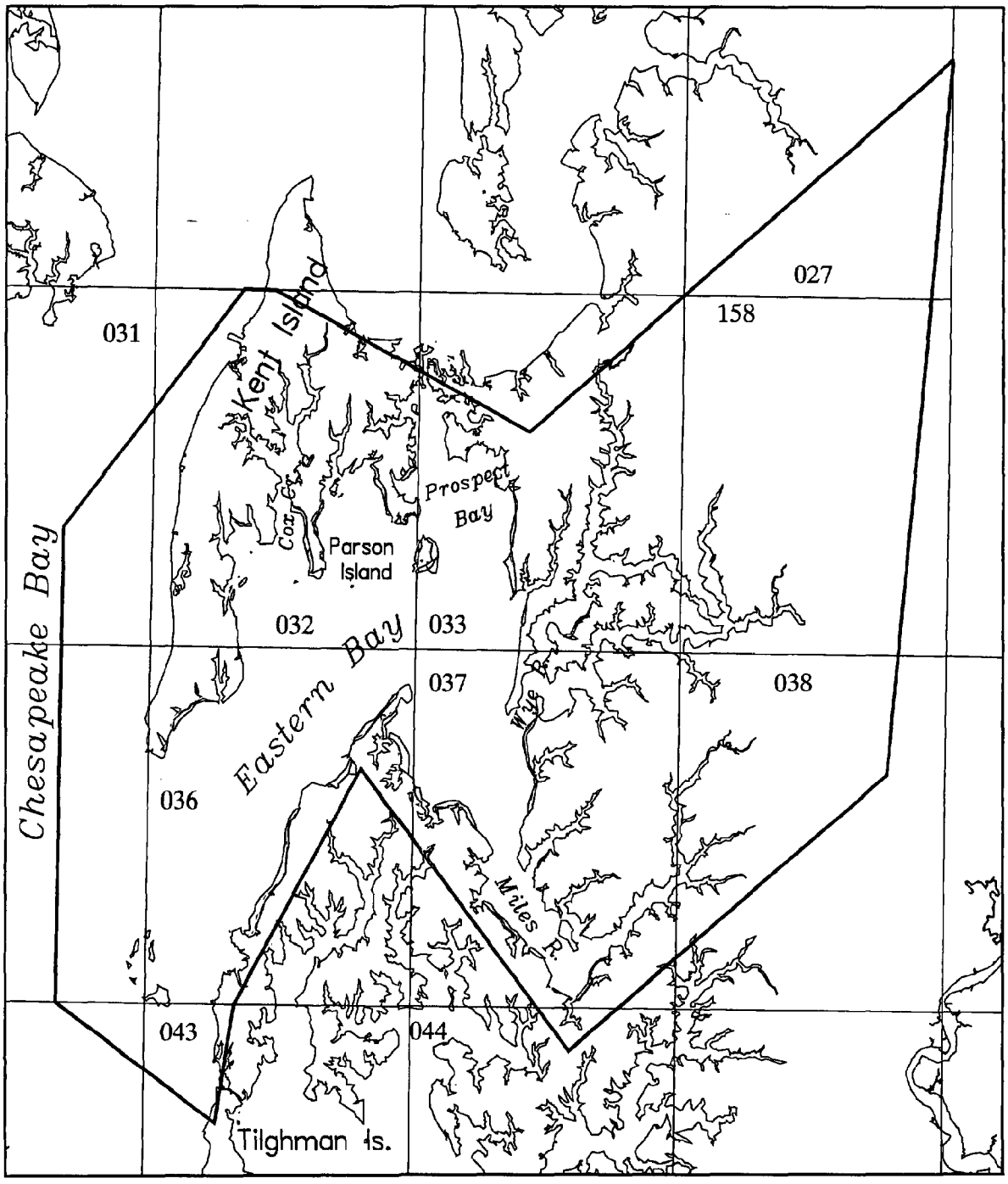

Figure 13. Distribution of SAV in the Eastern Bay (Section 6) in 1993.

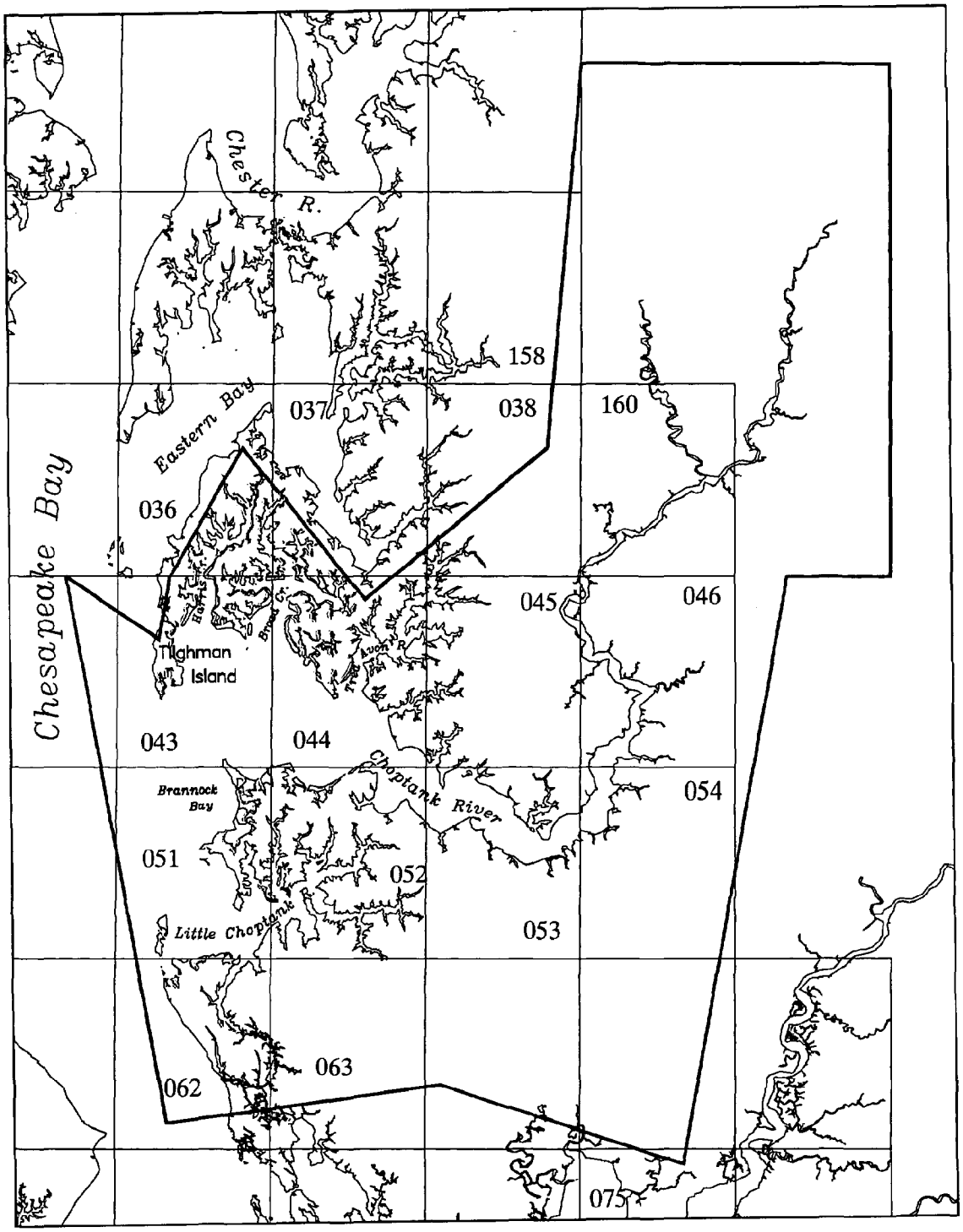

Figure 14. Distribution of SAV in the Choptank River (Section 7) in 1993.

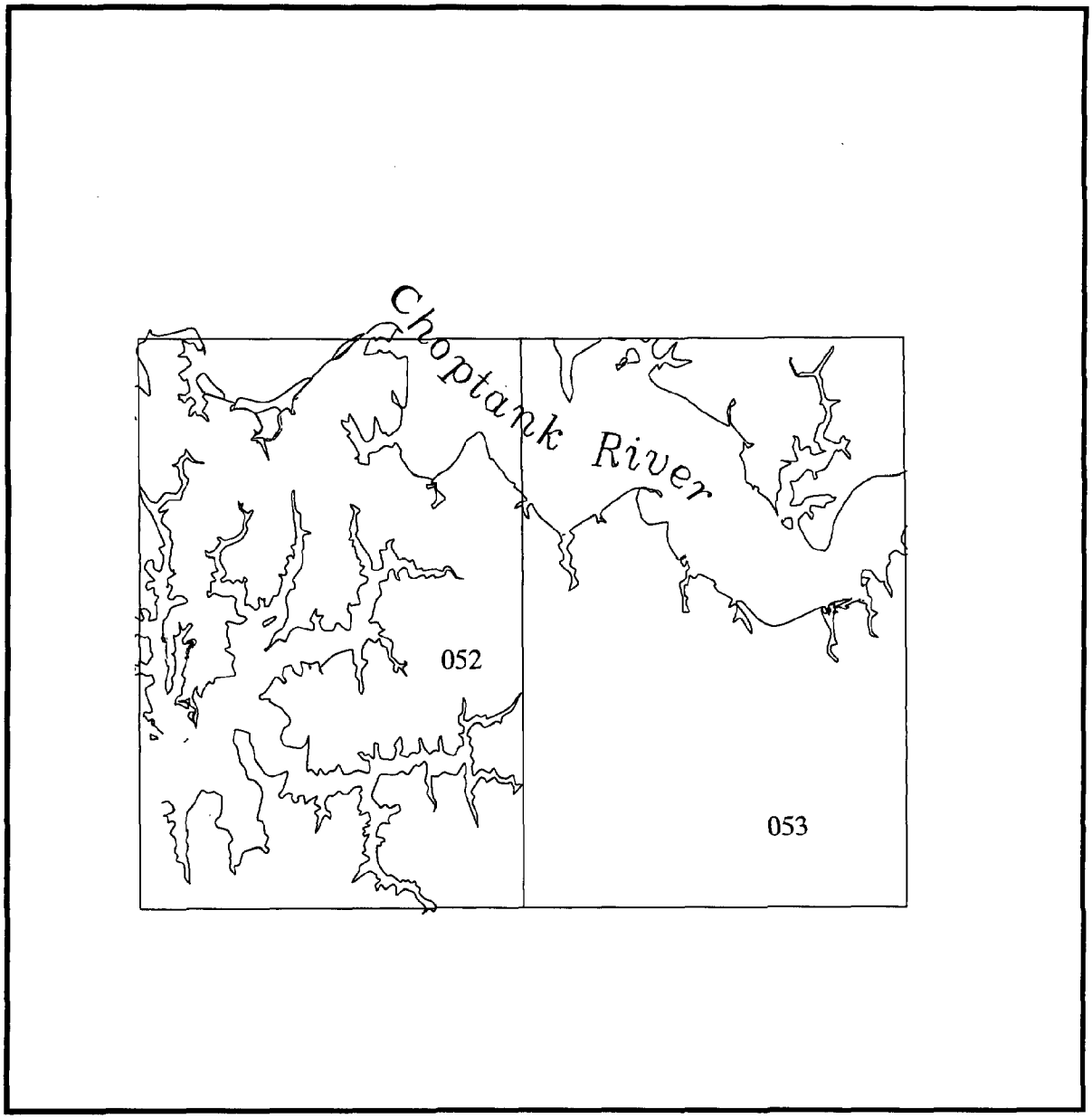

Figure 15. Detail of Figure 14 showing distribution of SAV in the Choptank River in 1993.

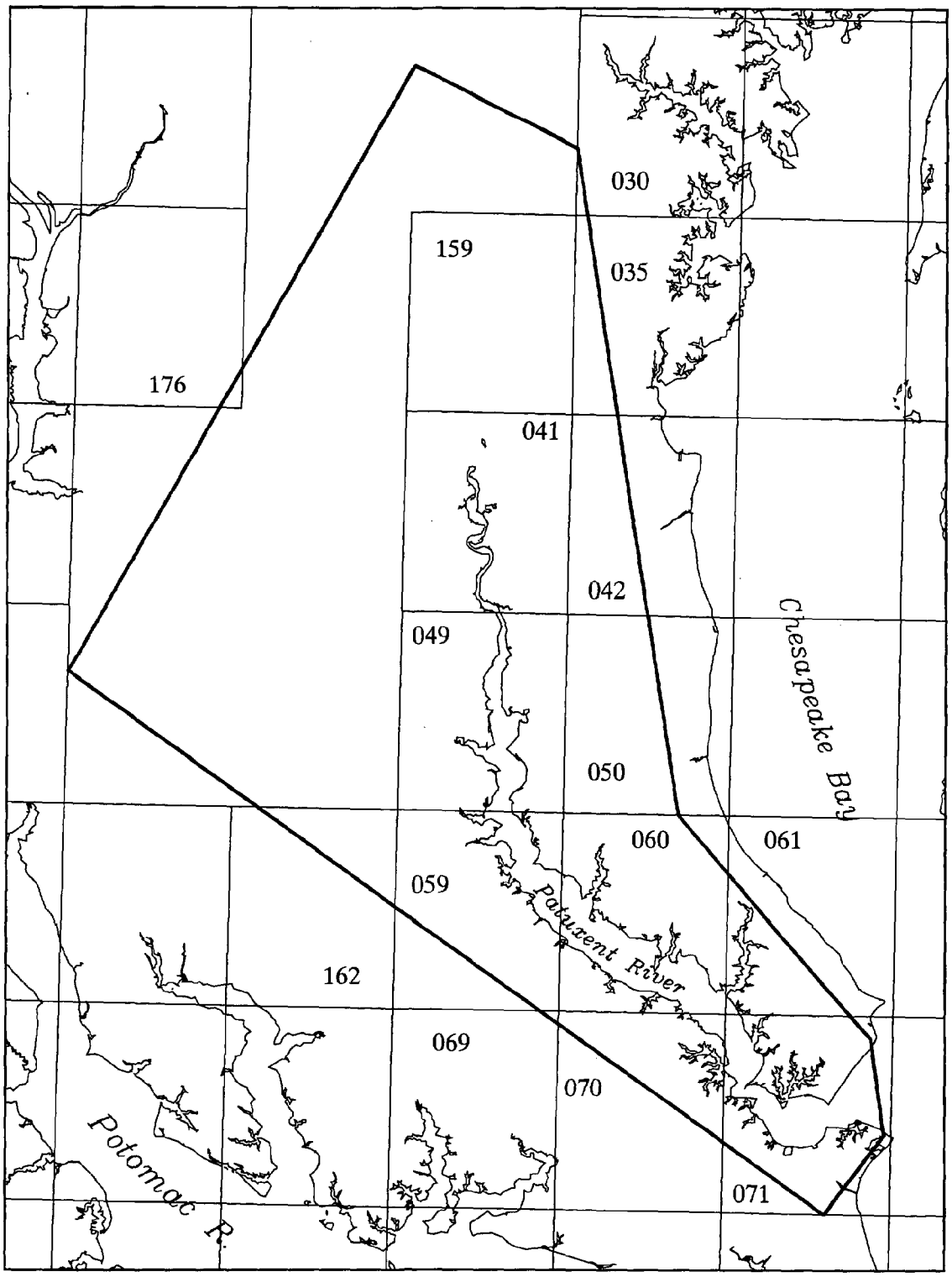

Figure 16. Distribution of SAV in the Patuxent River (Section 8) in 1993.

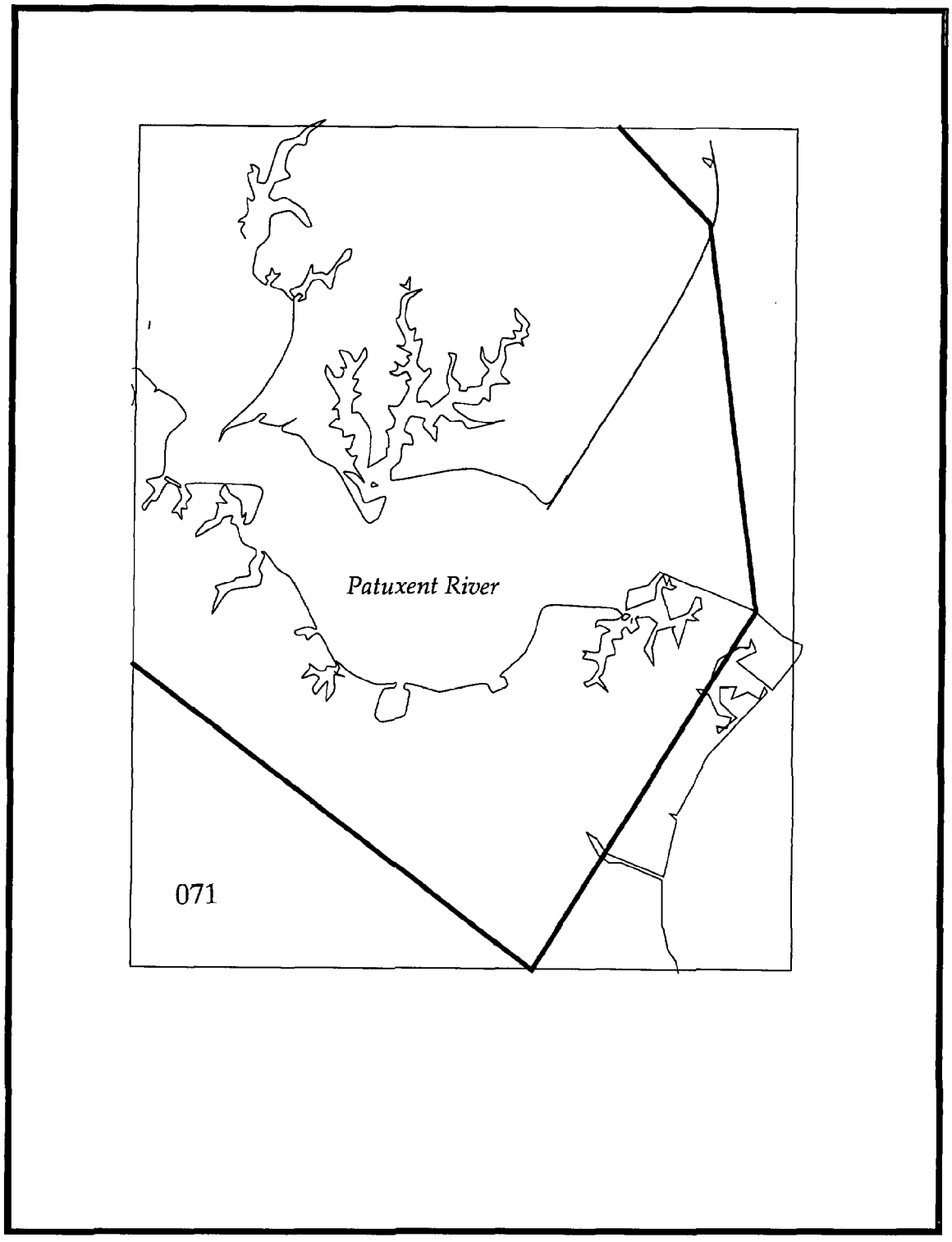

Figure 17. Detail of Figure 16 showing distribution of SAV in the Patuxent River in 1993.

reported from the lower portion of the Patuxent River in Saint Leonard, Island, Hominy, and Cuckold creeks; Peterson Point; and Green Holly Pond (Appendix C, Maps 60, 61, 70, and 71).

9. Middle Western Shore

There were no SAV beds identified in the Middle Western Shore section in 1993 (Tables 4-7; Figure 18) the same as in 1992.

10. Lower Potomac River

There were 458 hectares of SAV identified in the Lower Potomac River section as indicated on the 1993 aerial photography (Tables 4-7; Figures 19, 20, and 21; Appendix C, Maps 56, 57, 58, 65, 66, 67, 80, 89, and 162), compared to 571 hectares reported in 1992 with most of the changes occurring in Nanjemoy Creek. In this section, 52.2% of the total coverage of SAV was dense (class 4), 20.7% was moderate (class 3), 25.0% was sparse (class 2), and 2.0% was very sparse (class 1) (Table 7; Figure 3). Most of the SAV occurred along Nanjemoy Creek and Port Tobacco River, as well as along the shoreline adjacent to these two creeks, and fringing the eastern side of Mathias Point Neck to an area just below the Route 301 Bridge (Harry Nice Memorial Bridge). Several small beds were observed in Machodoc, Rosier, and Cuckold creeks; the St. Marys River; in Calvert Bay at the mouth of Smith Creek; Lloyd Point; above Lower Cedar Point; and in the upper Wicomico River.

Ground survey data was available from Citizens' and VIMS surveys for Maps 68, 76, 78, and 80 (Appendix C). *Zannichellia palustris* and *P. crispus* were reported from the Lower Machodoc Creek (Appendix C, Map 78). *Zannichellia palustris* was found in Neale Sound off the Wicomico River (Appendix C, Map 68). *Ruppia maritima* was reported from the St. Marys River (Appendix C, Map 80). *Myriophyllum spicatum* was reported in Popes Creek (Appendix C, Map 76).

11. Upper Potomac River

There were 2,363 hectares of SAV mapped in the Upper Potomac River section (Tables 4-7; Figures 22, 23, and 24; Appendix C, Maps 28, 29, 34, 39, 40, 47, 48, 55, 64, 65, and 161) in 1993, compared to 2,462 hectares reported in 1992, a decrease of 4%. A total of 80.9% of the SAV beds were densely vegetated (class 4), 10.3% was moderate (class 3), 5.1% was sparse (class 2), and 3.7% was very sparse (class 1) (Table 7; Figure 3). Although there was an overall reduction in SAV abundance, there was a notable change in SAV distribution in the Alexandria quadrangle (Appendix C, Map 34). An expansive shoal area in the middle of the river, just above the large dense bed surrounding the Woodrow Wilson Bridge, supported sparse SAV (bed FB1) for the first time in 1993. The western side of the mainstem Potomac River, from the Woodrow Wilson Bridge to Occoquan Bay remains very sparsely vegetated.

Ground survey data was available only from USGS and Citizens' surveys for Maps 28, 34, 39, 40,

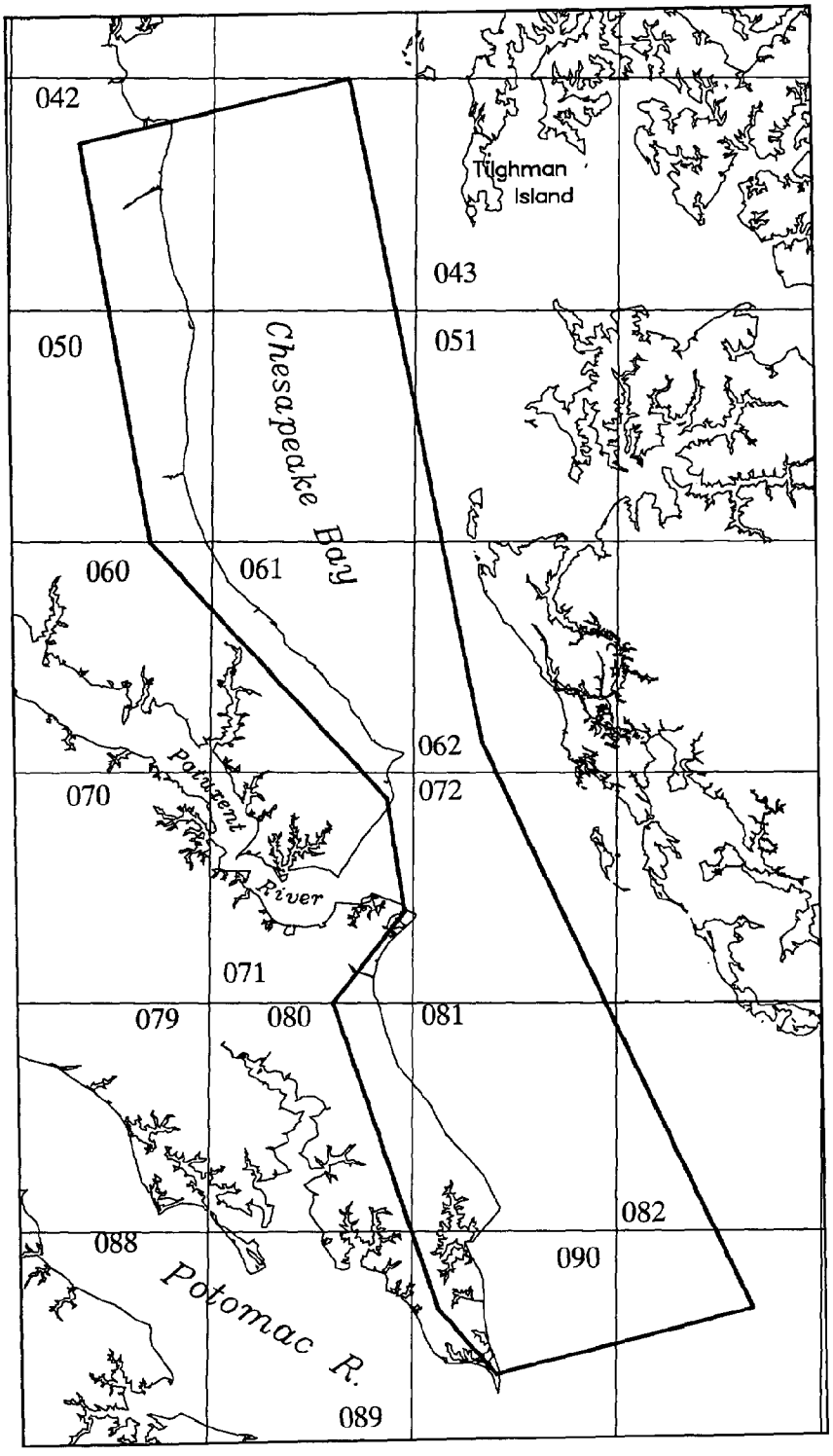

Figure 18. Distribution of SAV in the Middle Western Shore (Section 9) in 1993.

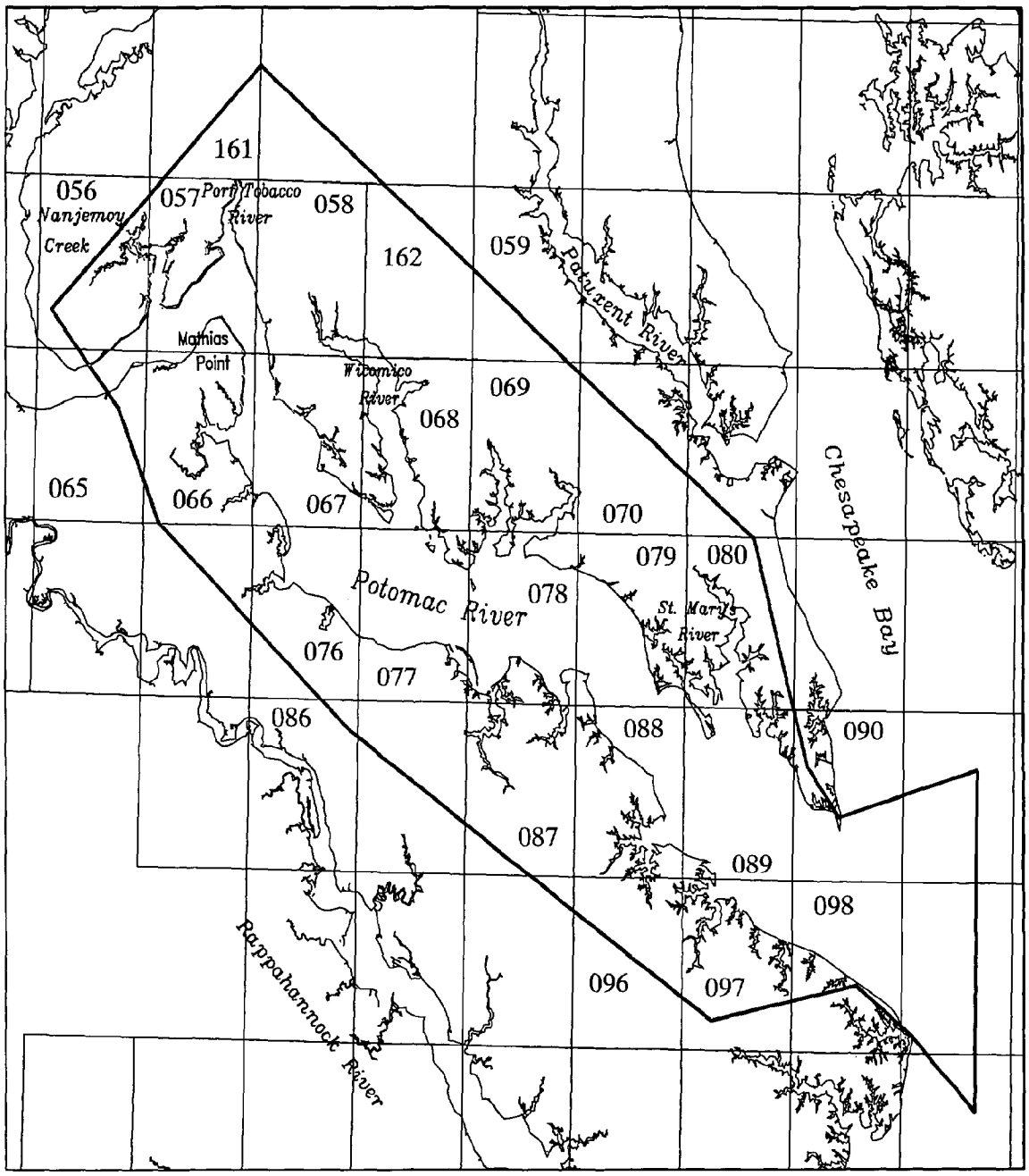

Figure 19. Distribution of SAV in the Lower Potomac River (Section 10) in 1993.

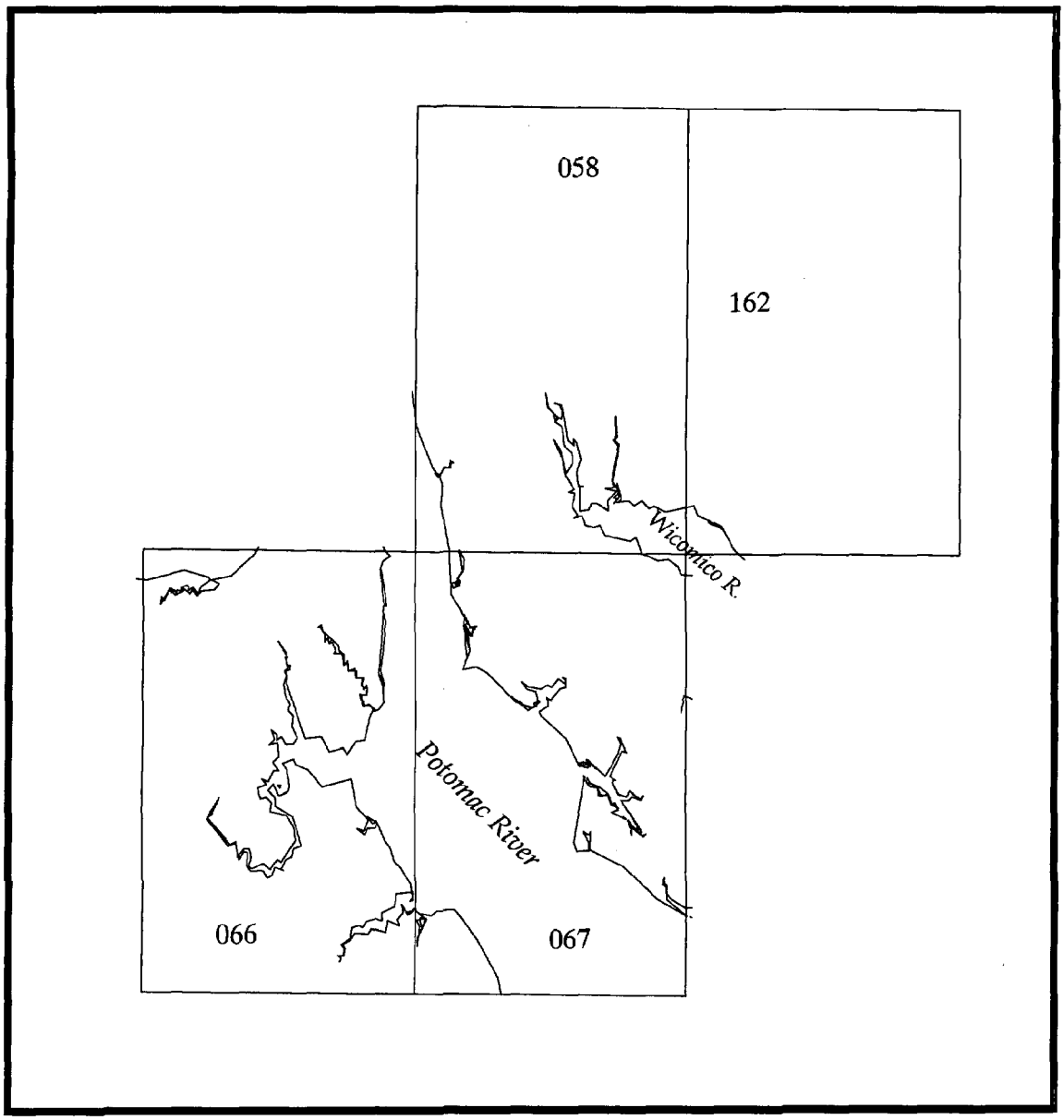

Figure 20. Detail of Figure 19 showing distribution of SAV in the Lower Potomac River in 1993.

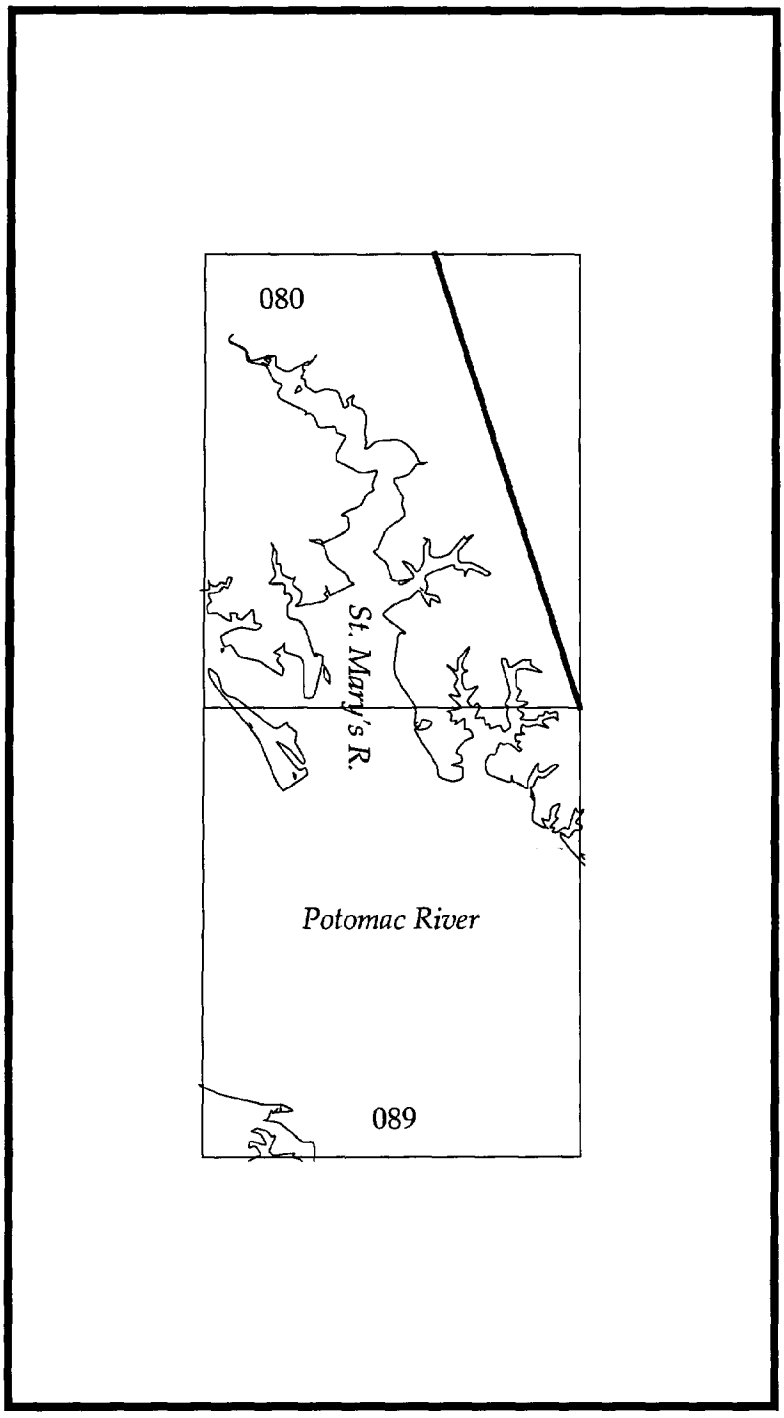

Figure 21. Detail of Figure 19 showing distribution of SAV in the Lower Potomac River in 1993.

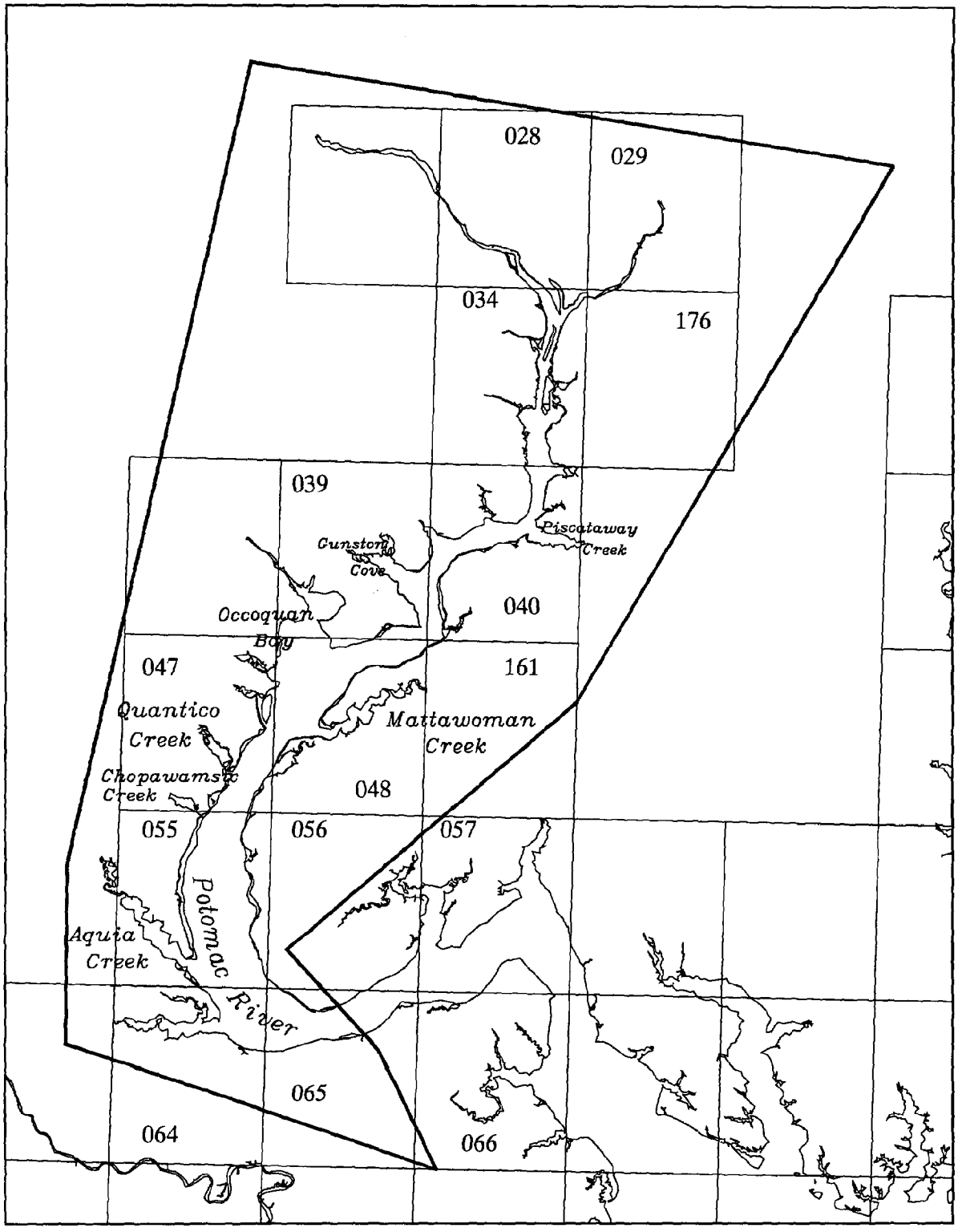

Figure 22. Distribution of SAV in the Upper Potomac River (Section 11) in 1993.

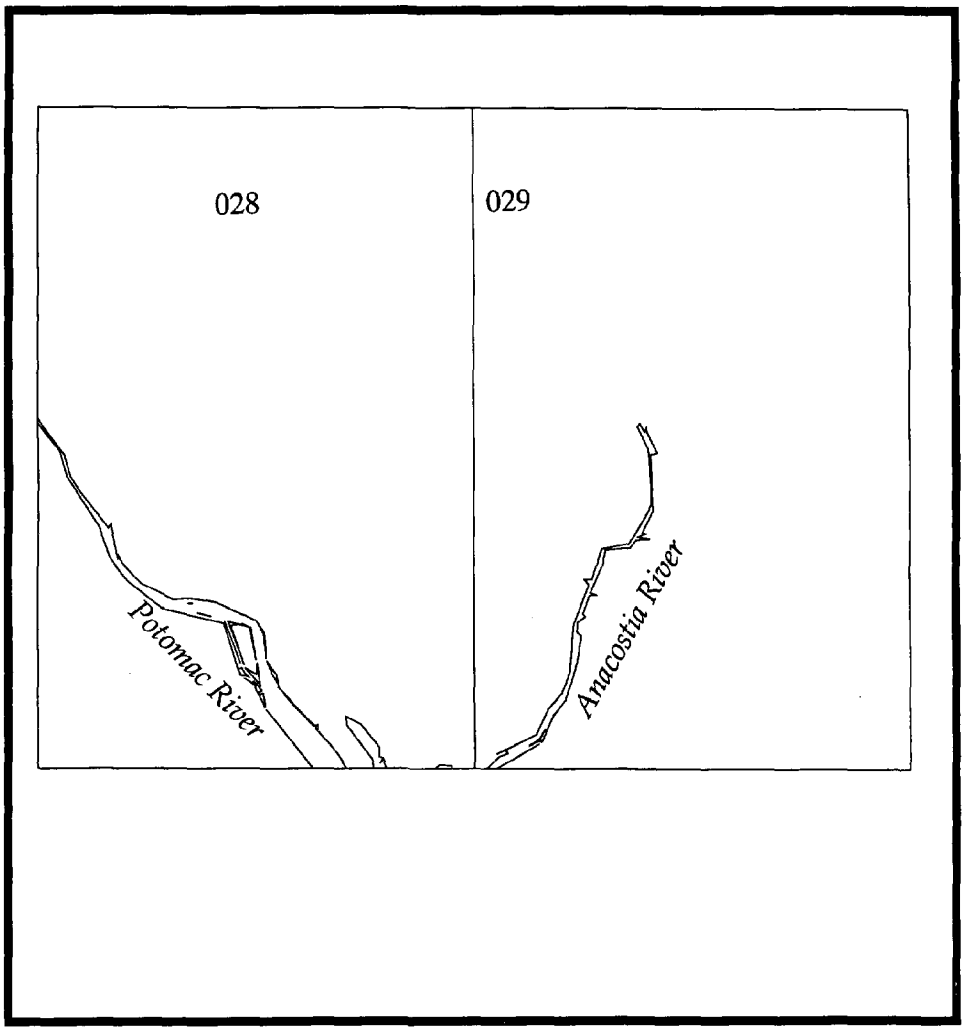

Figure 23. Detail of Figure 22 showing distribution of SAV in the Upper Potomac River in 1993.

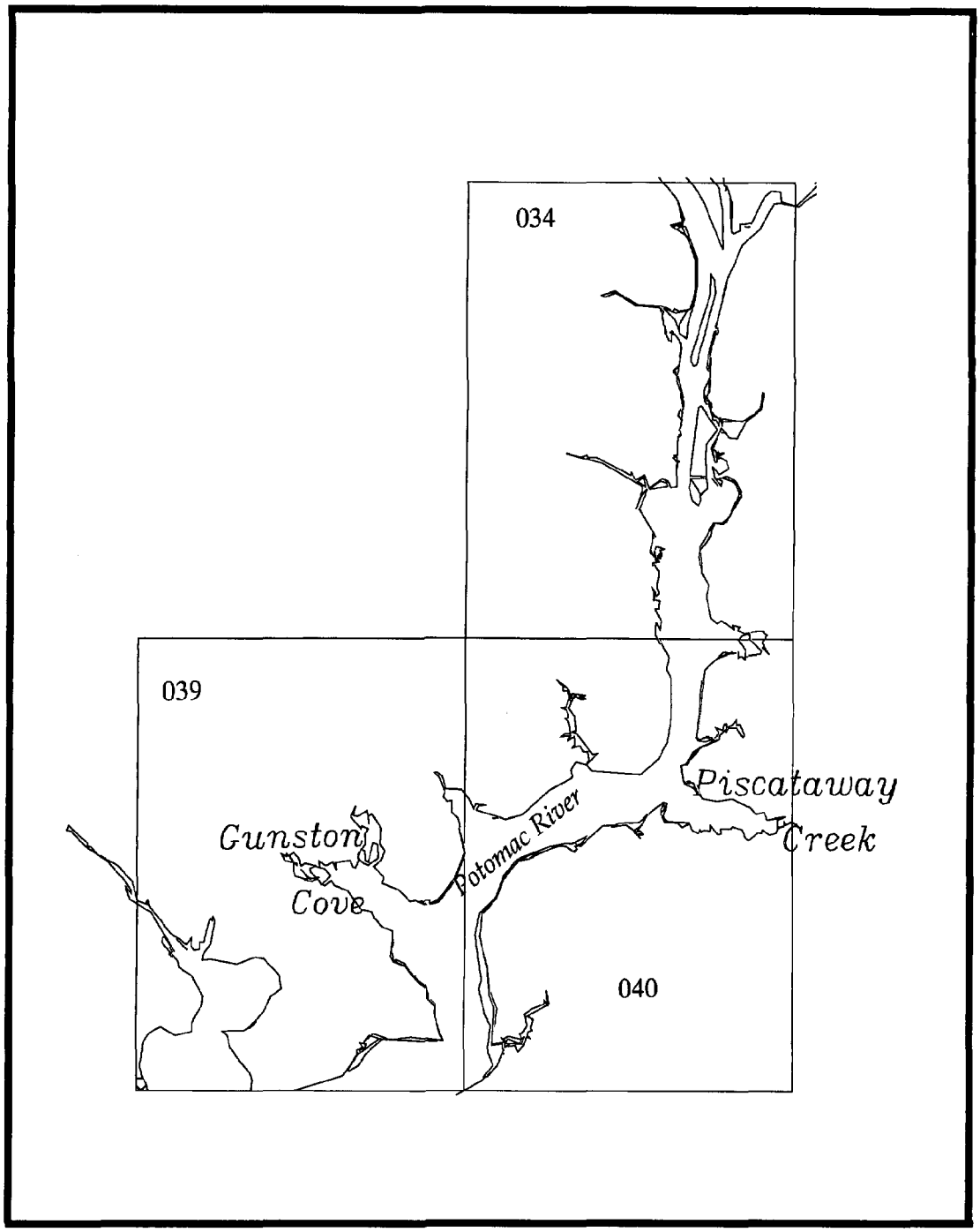

Figure 24. Detail of Figure 22 showing distribution of SAV in the Upper Potomac River in 1993.

47, 48, 55, and 161 (Appendix C). Nine species were reported: *M. spicatum, V. americana, H. verticillata, N. guadalupensis, C. demersum, H. dubia, P. pectinatus, P. crispus,* and *N. minor.*

12. **Middle Eastern Shore**

There were 2,972 hectares of SAV identified in the Middle Eastern Shore section (Tables 4-7; Figure 25; Appendix C, Maps 63, 72, 73, 74, 82, 83, 84, 85, 92, 93, 100, and 101) in 1993, compared to 3,047 hectares reported in 1992. In this section, 17.6% of the SAV was dense (class 4), 36.2% moderate (class 3), 40.8% sparse (class 2), and 5.4% very sparse (class 1) (Table 7; Figure 3). SAV beds were very abundant in: 1) the Honga River, 2) between Barren Island and Meekins Neck-Upper Hooper Island, and 3) the lower Manokin and the Big and Little Annemessex rivers. SAV abundance declined in the Barren Island area from 1992 (Barren Island quadrangle - 434 hectares in 1992 to 206 hectares in 1993), while increasing in the Honga River area (Honga quadrangle - 1,327 hectares in 1992 to 1340 hectares in 1993; Wingate quadrangle - 481 hectares in 1992 to 541 hectares in 1993; Golden Hill quadrangle - 29 hectares in 1992 to 65 hectares in 1993). No SAV beds were observed in Fishing or Monie bays, and in the Nanticoke and Wicomico rivers. Ground survey data were available for this section in 1993 from Citizens' and VIMS surveys (Appendix C, Maps 72, 73, 74, 84, 100, and 101). *Ruppia maritima* and *Z. marina* was reported most frequently.

13. **Mid-Bay Island Complex**

There were 5,467 hectares of SAV mapped in the Mid-Bay Island Complex in 1993 (Tables 4-7; Figure 26; Appendix C, Maps 83, 91, 92, 99, 100, 107, and 179), compared to 5,994 hectares reported in 1992, an 8.8% decrease, and with declines in abundance noted in all quadrangles. This section contains 18.5% of the SAV in the entire Chesapeake Bay, slightly less than the 21.0% in 1992. However, the density of SAV has decreased since 1992. In 1993, 37.1% of the SAV within this section was in dense and moderate beds (classes 3 and 4), compared to 70.8% in 1992. In the remaining classes, 55.4% was sparse (class 2), compared to 27.1% in 1992, and 7.4% was very sparse (class 1) compared to 2.1% in 1992 (Table 7; Figure 3).

SAV is present mainly in dense to moderate beds along the broad, expansive shoal area between Tangier Island and Smith Island; the eastern side of Tangier Island; the western side of Goose Island; Mailboat Harbor; and on the shoals and in the coves adjacent to Bloodsworth, South Marsh, Holland, Adam, and Spring islands. The Citizens' ground survey reported *R. maritima,* and Z. marina (Appendix C, Map 99) for this section in 1993.

Lower Bay Zone

14. **Lower Eastern Shore**

There were 6,299 hectares of SAV observed in the Lower Eastern Shore section in 1993 (Figure 27;

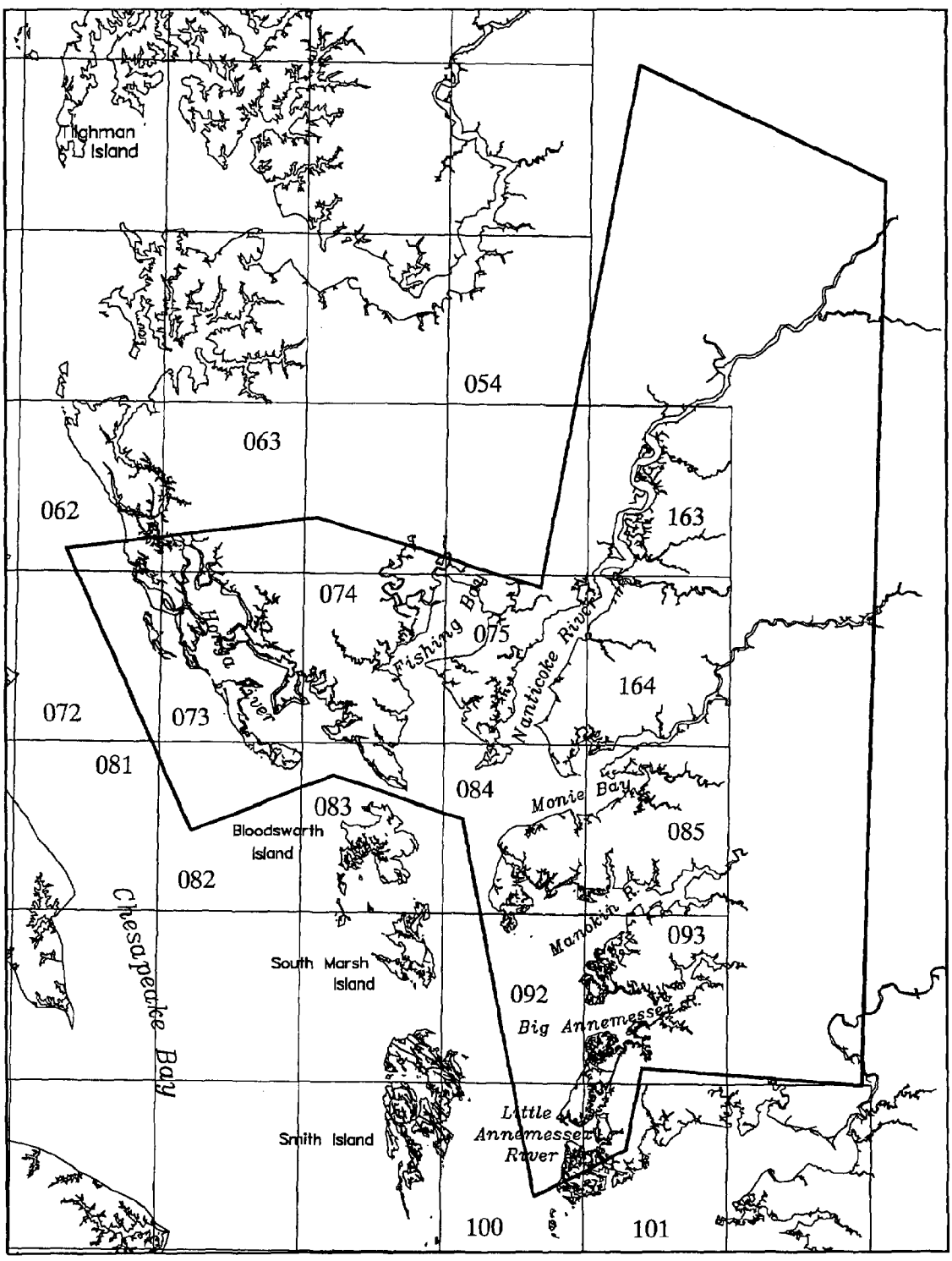

Figure 25. Distribution of SAV in the Middle Eastern Shore (Section 12) in 1993.

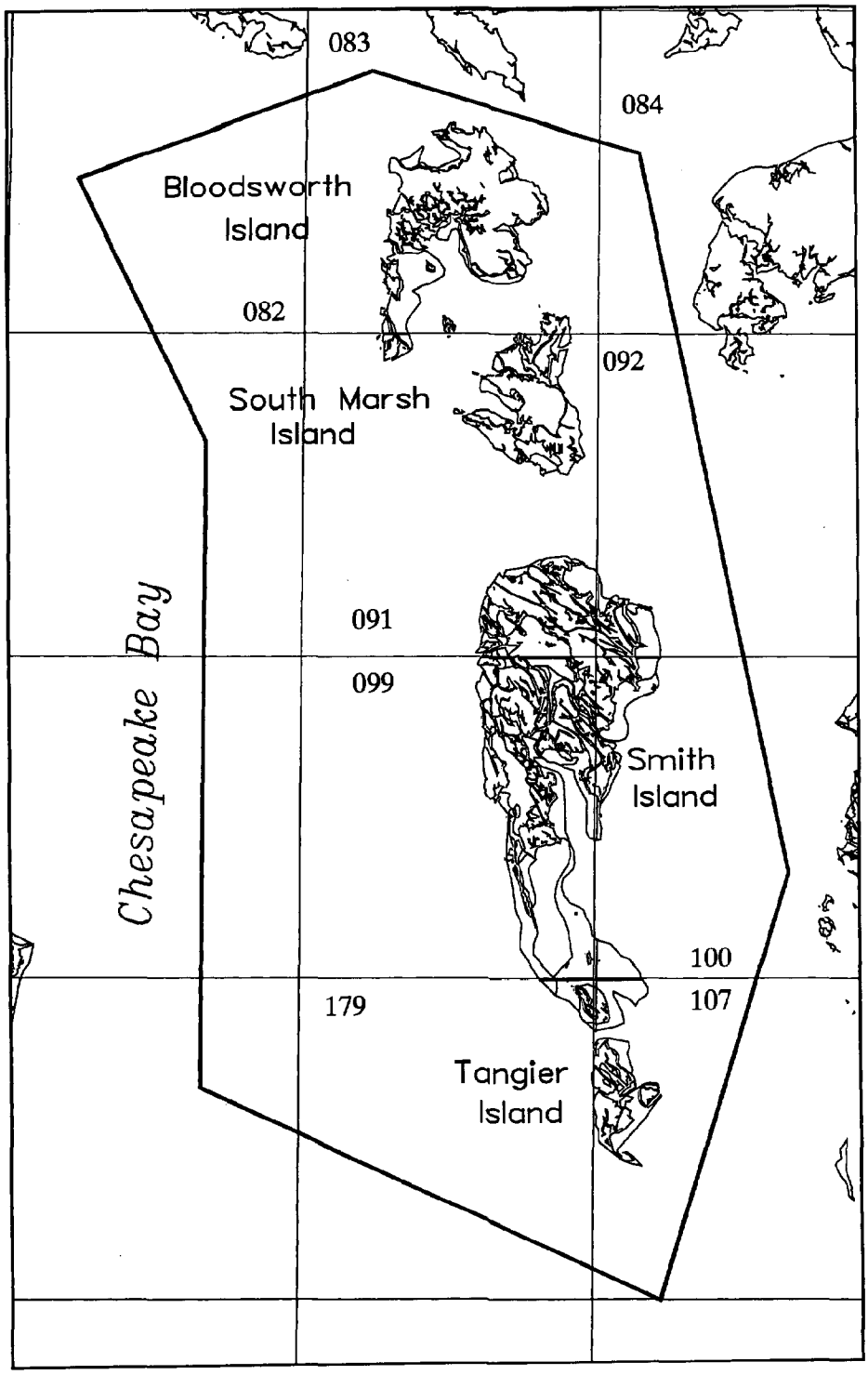

Figure 26. Distribution of SAV in the Mid-Bay Island Complex (Section 13) in 1993.

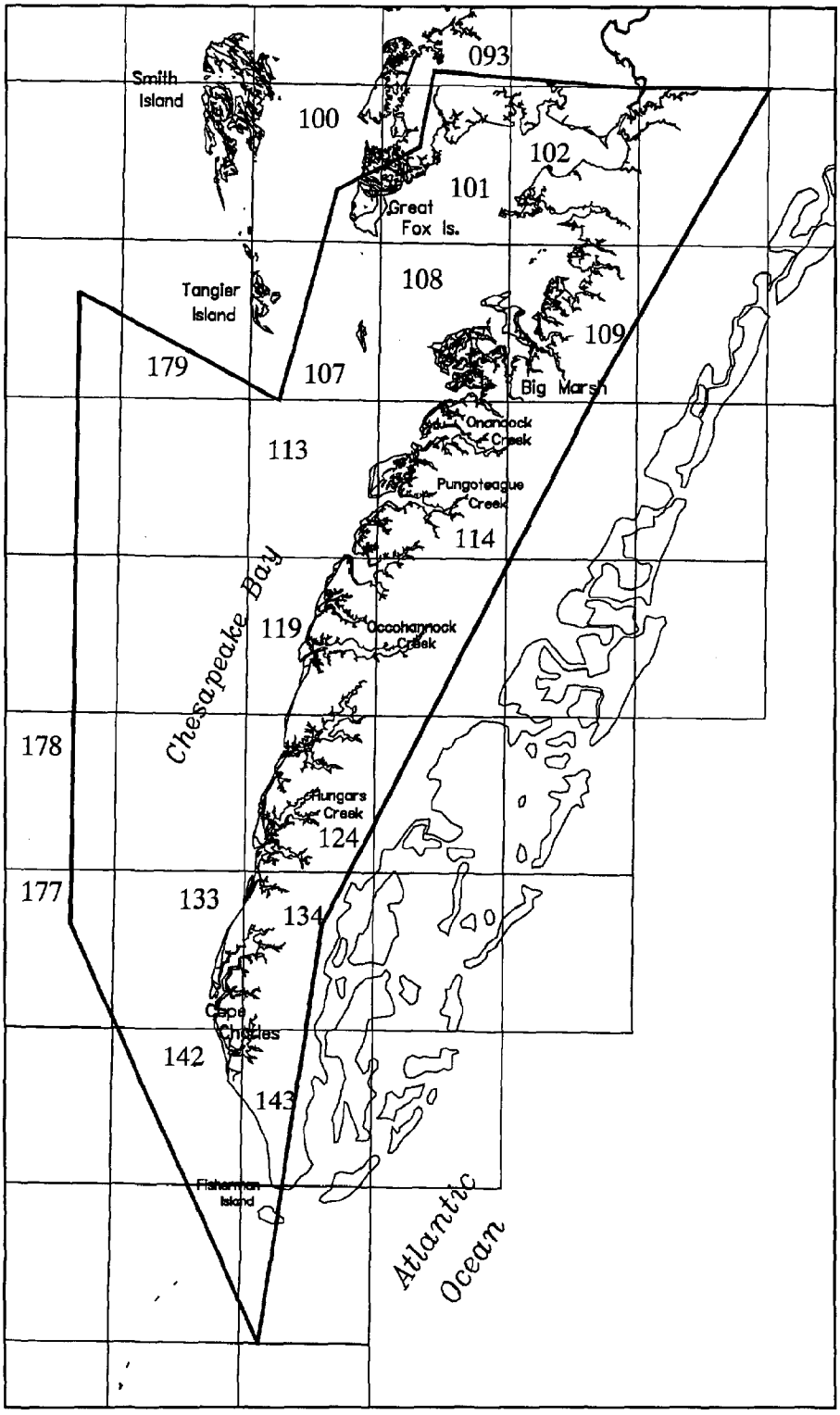

Figure 27. Distribution of SAV in the Lower Eastern Shore (Section 14) in 1993.

Tables 4-7; Appendix C, Maps 100, 101, 102, 107, 108, 109, 113, 114, 119, 124, 133, 134, and 142), compared to 5,920 hectares reported in 1992. In this section 33.9% of the total SAV was dense (class 4), 16.0% was moderate (class 3), 39.3% was sparse (class 2), and 10.9% was very sparse (class 1) (Table 7; Figure 3). Large, dense beds continue to persist at the mouth of Cherrystone Inlet near Cape Charles, and at the mouths of Hungars, Nassawadox, Mattawoman, Occohannock, Craddock, Pungoteague, Onancock, Nandua, and Chesconessex creeks. Large, dense beds also occur at the Big Marsh area near Chesconessex Creek, at Webb and Halfmoon islands off the mouth of Deep Creek, and on the large shoal area on the eastern side of the Fox and Cedar islands. SAV beds also were mapped along Ware Point Marsh and around Beasley Bay in the Pocomoke Sound. There was no SAV from Elliots Creek, just below Cape Charles, to Fishermans Island at the mouth of Chesapeake Bay. Ground survey data were limited in this section. Citizens' and VIMS surveys reported *R. maritima* and *Z. marina* from this section (Appendix C, Maps 100, 101, 114, 124, and 133).

15. **Reedville Region**

There were 813 hectares of SAV identified in the Reedville Region in 1993 (Tables 4-7; Figure 28; Appendix C, Maps 106 and 112), compared to 778 hectares reported in 1992. In this section, 20.1% of the total coverage of SAV was dense (class 4), 22.2% was moderate (class 3), 42.2% was sparse (class 2), and 15.6% was very sparse (class 1) (Table 7; Figure 3). Most beds were found in Little, Fleets, and Ingram bays; Dymer, Indian, Dividing, Ball, and Cloverdale creeks; Dameron Marsh; and adjacent to Fleeton Point. *Zostera marina* and *R. maritima* were the two species identified by Citizens' surveys (Appendix C, Maps 106 and 112).

16. **Rappahannock River Complex**

There were 722 hectares of SAV observed in the Rappahannock River Complex in 1993 (Tables 4-7; Figure 29; Appendix C, Maps 111, 117, 118, and 123), compared to 587 hectares reported in 1992. In this section 8.0% of the total coverage of SAV was dense (class 4), 22.3% was moderate (class 3), 60.4% was sparse (class 2), and 9.2% was very sparse (class 1) (Table 7; Figure 3). SAV beds were present in the Corrotoman River; along the north shore of the Rappahannock River, from the Corrotoman River to Windmill Point, Milford Haven, the lower Piankatank River; and from Ginney and Horse points to Gwynns Island. SAV beds have declined in the area between Carters Creek and the mouth of the Corrotoman River. The large SAV bed adjacent to Windmill Point that has been slowly expanding naturally since 1989 (contiguous beds BB2, CB1, DB4; Appendices C and D, Map 118), now covers an area of 44 hectares, up from 28 hectares in 1992, with both *Z. marina* and *R. maritima* present. SAV beds are abundant in Milford Haven, but are principally located along the north shore with both *Z. marina* and *R. maritima* present. *Ruppia maritima* and *Z. marina* were reported from ground surveys by VIMS staff and Citizens' surveys of SAV in Maps 111, 118, and 123 (Appendix C).

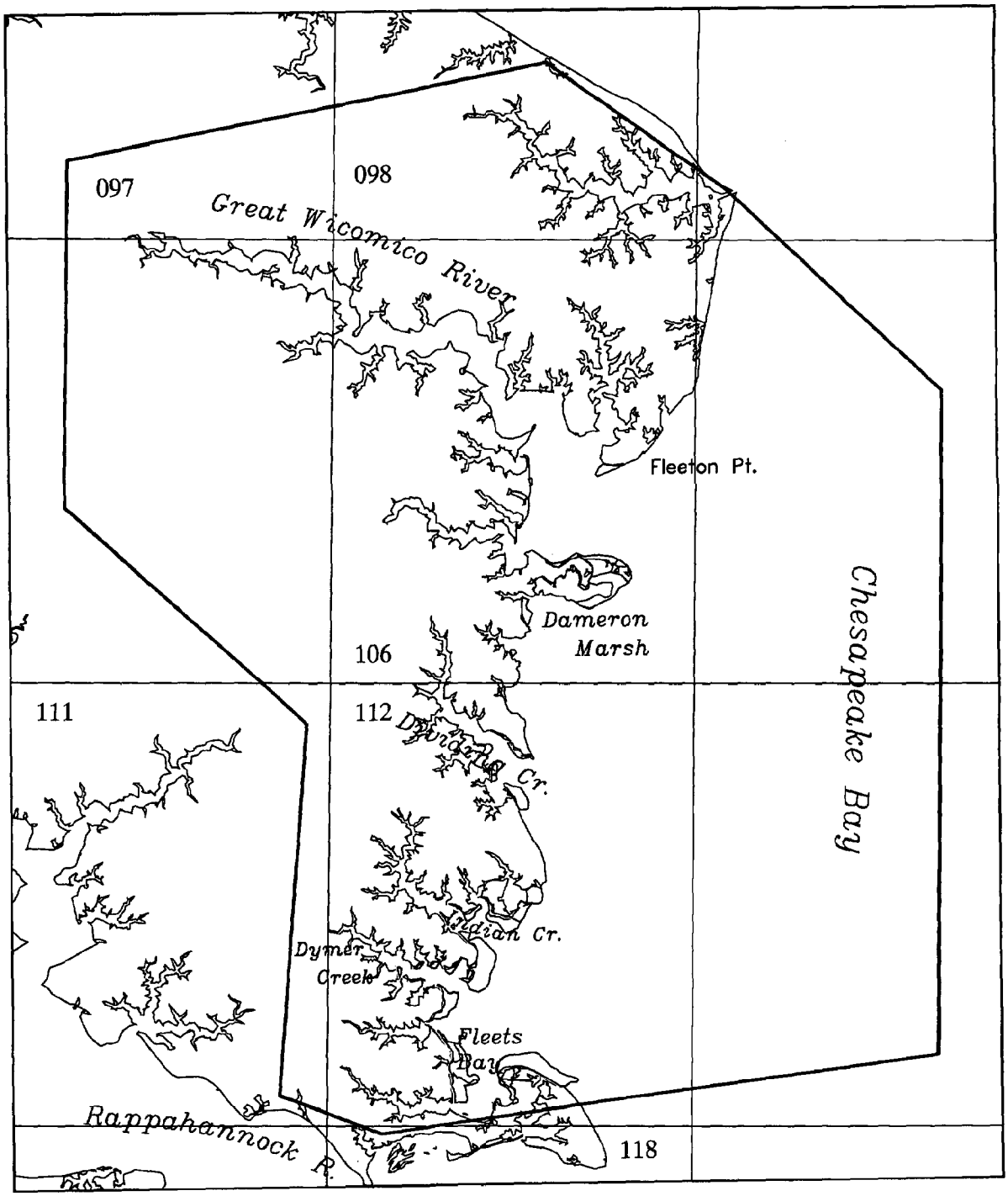

Figure 28. Distribution of SAV in the Reedville Region (Section 15) in 1993.

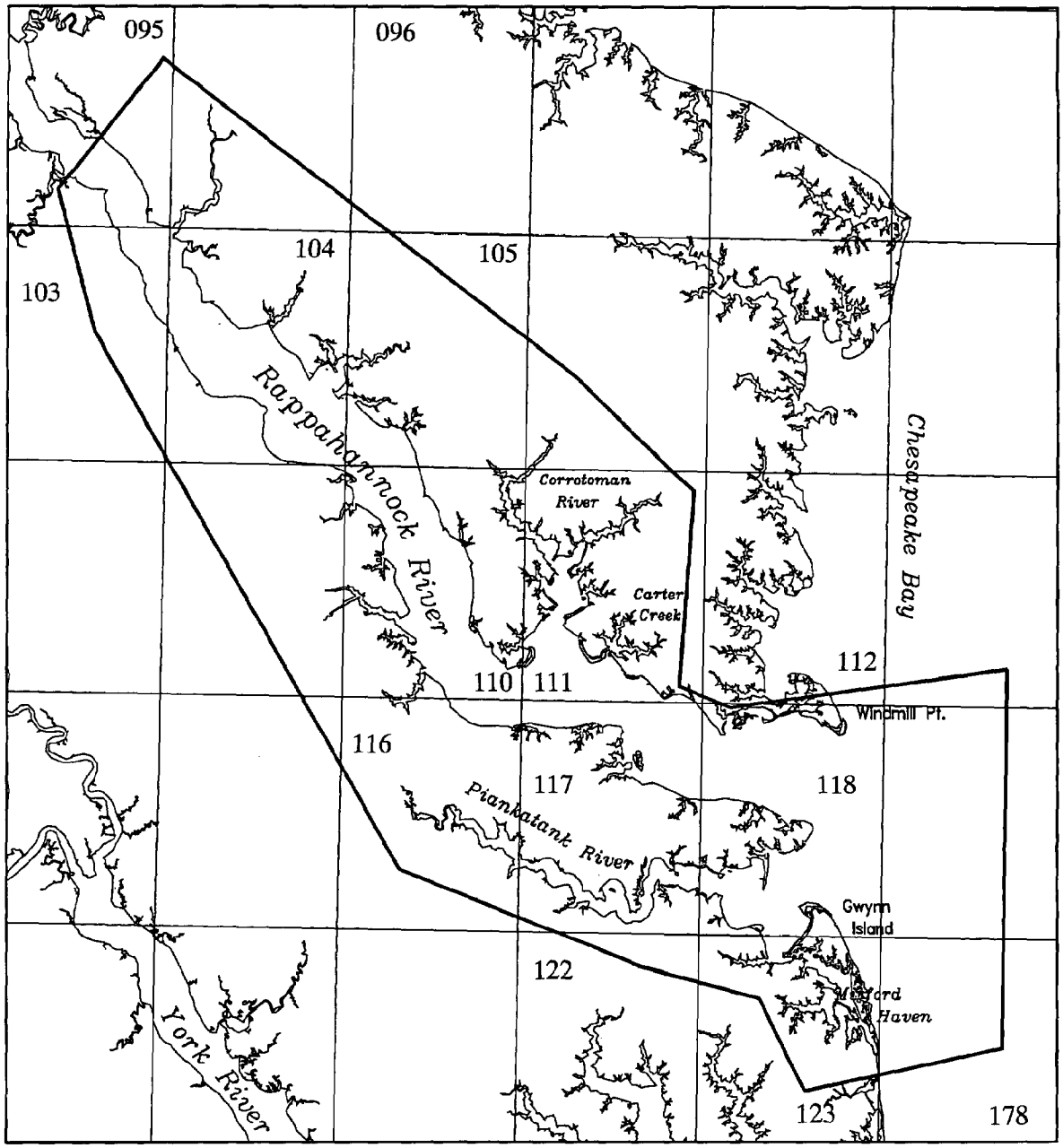

Figure 29. Distribution of SAV in the Rappahannock River Complex (Section 16) in 1993.

17. **New Point Comfort Region**

There were 431 hectares of SAV identified in the New Point Comfort Region in 1993 (Tables 4-7; Figure 30; Appendix C, Map 123, 132, 177, and 178), compared to 396 hectares reported in 1992. In this section 16.3% of the total coverage of SAV was dense (class 4), 57.4% was moderate (class 3), 18.5% was sparse (class 2), and 7.8% was very sparse (class 1) (Table 7; Figure 3). SAV beds were present from New Point Comfort just north of Horn Harbor at Potato Neck. SAV beds were also present at Winter Harbor. There was no ground truth data reported for this section.

18. **Mobjack Bay Complex**

The Mobjack Bay Complex contained 1,843 hectares of SAV in 1993 (Tables 4-7; Figure 31; Appendix C, Maps 122, 123, 131, and 132), compared to 1,818 hectares reported in 1992. SAV beds were abundant along the entire shoreline of Mobjack Bay, as well as in the lower reaches of the four tributaries: Severn, Ware, North, and East rivers. The Mobjack Bay area continued to harbor some of the more extensive SAV beds on the western shore of the lower Chesapeake Bay. In this section 70.1% of the total coverage of SAV was dense (class 4), 9.8% was moderate (class 3), 16.0% was sparse (class 2), and 4.2% was very sparse (class 1) (Table 7; Figure 3). *Zostera marina* and *R. maritima* were reported by Citizens' and VIMS surveys from Maps 122, 131, and 132 (Appendix C).

19. **York River**

There were 841 hectares of SAV observed in the York River section in 1993 (Tables 4-7; Figure 32; Appendix C, Maps 131, 132, 139, and 140), compared to 830 hectares reported in 1992. In this section 82.3% of the total coverage is classified as dense (class 4), while 0.0% was moderately dense (class 3), 16.1% was sparse (class 2), and 1.6% was very sparse (class 1) (Table 7; Figure 3). Ground survey information was available for Maps 131, 132, 139, and 140 (Appendix C) from VIMS and Citizens' surveys. Dense SAV beds, consisting of both *Z. marina* and *R. maritima*, were located principally along the north shore from Gloucester Point to the mouth of the river and on the south shore adjacent to Goodwin Island. SAV beds were absent upstream of Gloucester Point along the north shore except for one small bed (Appendix C, Map 139, bed FA1) of *Z. marina* near Gloucester Point, a result of a VIMS transplanting project using seeds in 1989, 1990, and 1991. SAV was documented for the first time since 1971 along the south shore from Yorktown to the Coast Guard pier (Orth and Gordon, 1975). These two very sparse beds (Appendix C, Map 140, beds AB1 and BB1) consisted of small patches of *Z. marina*. These patches were most likely the result of seed recruitment in the spring of 1991 from SAV beds downriver on the south shore (Goodwin Island), or along the north shore directly across the river. This conclusion is based upon an understanding of the reproductive biology of *Z. marina*, which produces reproductive shoots in the second year of growth. These patches were too small in 1992 to have been documented by aerial photography. The presence of reproductive shoots in 1993 indicated that these patches had to be growing here in 1992,

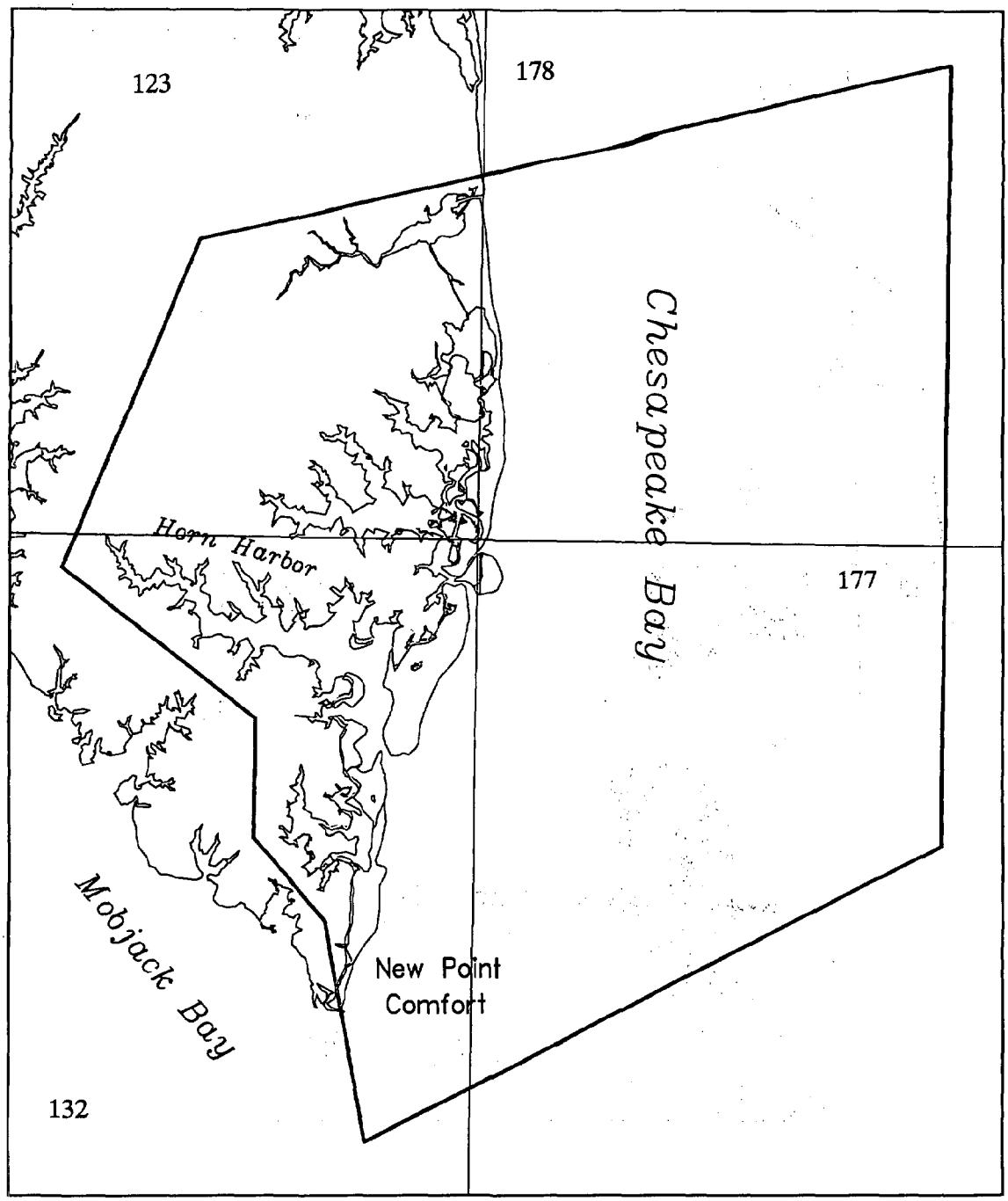

Figure 30. Distribution of SAV in the New Point Comfort Region (Section 17) in 1993.

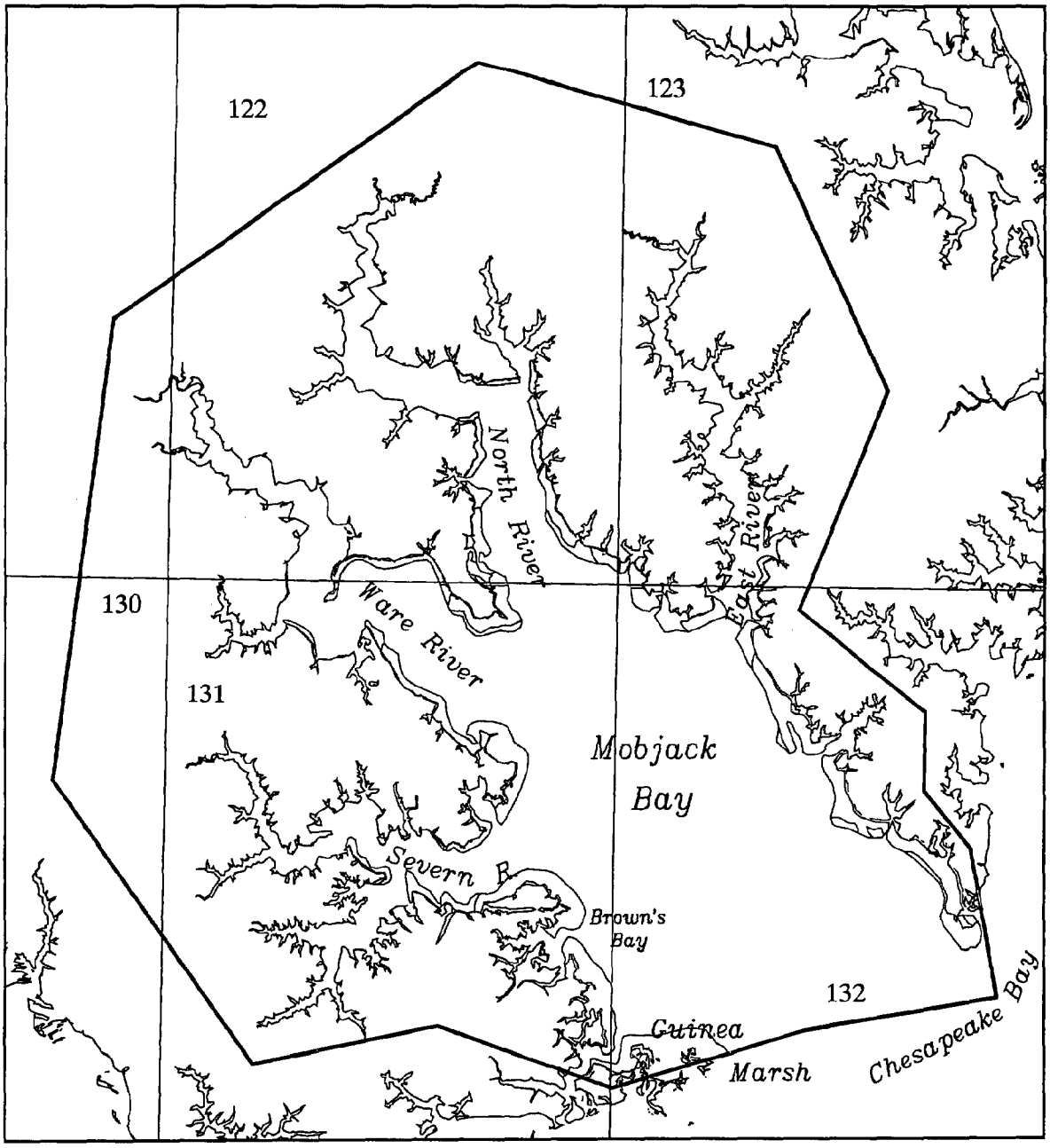

Figure 31. Distribution of SAV in the Mobjack Bay Complex (Section 18) in 1993.

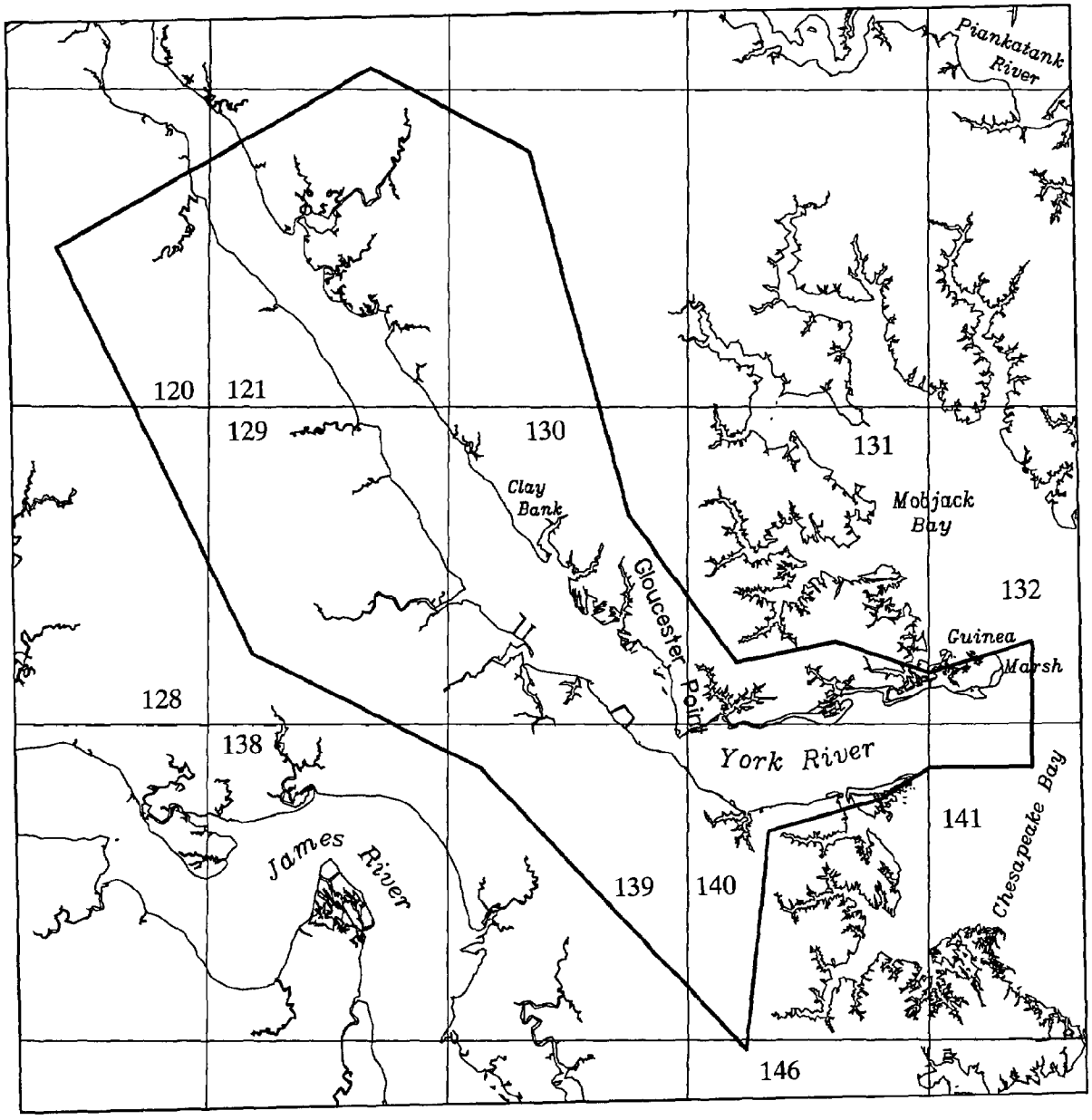

Figure 32. Distribution of SAV in the York River (Section 19) in 1993.

but were from seeds produced and germinated in 1991.

Zostera marina was transplanted in the form of whole plants to the following sites: along the north shore at Claybank, and Mumford and Catlett Islands; and along the south shore at Yorktown. The transplanting effort was conducted by VIMS staff during the fall of 1992. Transplants remained present through the summer of 1993. By the late summer of 1993, transplants survived at the Mumford Island and Yorktown sites, but did not survive at the Catlett Island or Clay Bank sites.

20. Lower Western Shore

There were 2,066 hectares of SAV mapped in the Lower Western Shore section in 1992 (Tables 4-7; Figure 33; Appendix C, Maps 140, 141, 147, and 152), compared to 2,029 hectares reported in 1992. In this section 44.0% of the total coverage was mapped as dense (class 4), 27.5% as moderate (class 3), 13.9% as sparse (class 2), and 14.6% as very sparse (class 1) (Table 7; Figure 3). SAV was mapped in Broad Bay; Back River, including the lower Northwest Branch; the lower Poquoson River; the mouth of the Poquoson River off Pasture and Hunts Neck; the lower Chisman Creek; Drum Island Flats; Poquoson Flats; adjacent to Crab Neck just south of Goodwin Island; and on the south side of Goodwin Island. No SAV was present in the Southwest Branch of Back River; in Back Creek; or from Northend Point to Old Point Comfort. Ground surveys by Citizens' and VIMS (Appendix C, Maps 140 and 152) reported both *Z. marina* and *R. maritima*.

21. **James River**

There were 4 hectares of SAV in the mainstem of the James River in 1993 (Tables 4-7; Figures 34 and 35; Appendix C, Map 147), compared to 3.5 hectares in 1992. This single, very dense bed, (class 4) (Table 7; Figure 3) located at the mouth of Hampton Creek adjacent to the Veteran's Hospital, consists of *Z. marina*, the species reported in previous ground surveys, and continues to remain the only SAV detected bed in the James River.

Chincoteague Bay

There were 3,576 hectares of SAV identified from the Eastern Shore of Virginia and Maryland in 1993. Chincoteague and Sinepuxent bays had 3556 hectares, and a small amount (20.35 hectares) was present in Isle of Wight and Assawoman bays (Tables 4-7; Figure 36; Appendix C, Maps 166, 167, 168, 170, 172, 173, 174, and 175), compared to 3,324 hectares reported in 1992. In this section 54.1% of the total coverage was mapped as dense (class 4), 16.9% as moderate (class 3), 26.3% as sparse (class 2), and 2.6% as very sparse (class 1) (Table 7; Figure 3). The Citizens' survey found both *Z. marina* and *R. maritima* throughout Chincoteague and Sinepuxent bays, as well as Assawoman bays (Appendix C, Maps 166, 167, 168, 170, 172, 173, and 175). All of the SAV in Chincoteague Bay continues to be present on the eastern side of the bay adjacent to Assateague Island. The vegetation remains concentrated in four relatively distinct areas identical to that reported

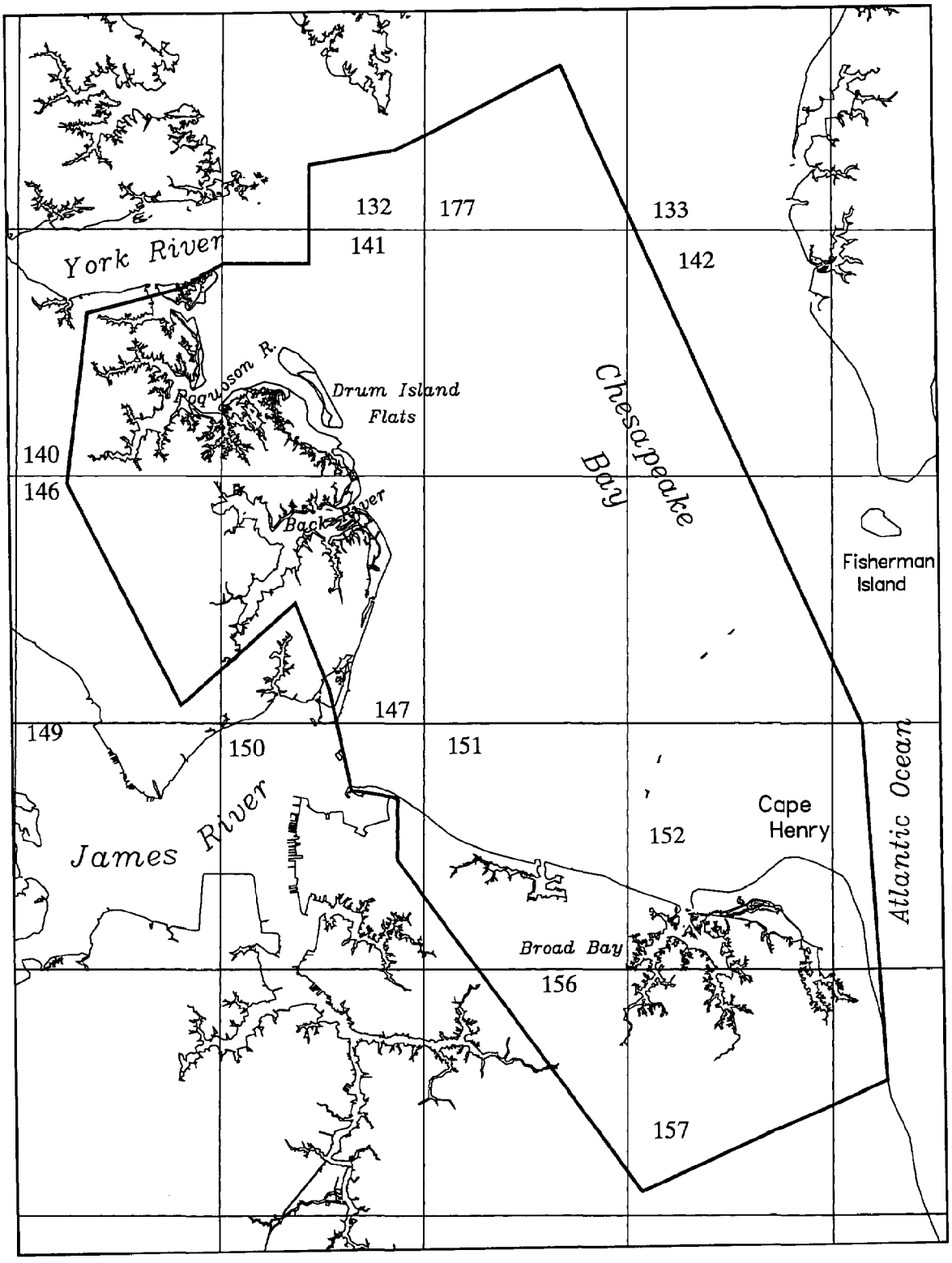

Figure 33. Distribution of SAV in the Lower Western Shore (Section 20) in 1993.

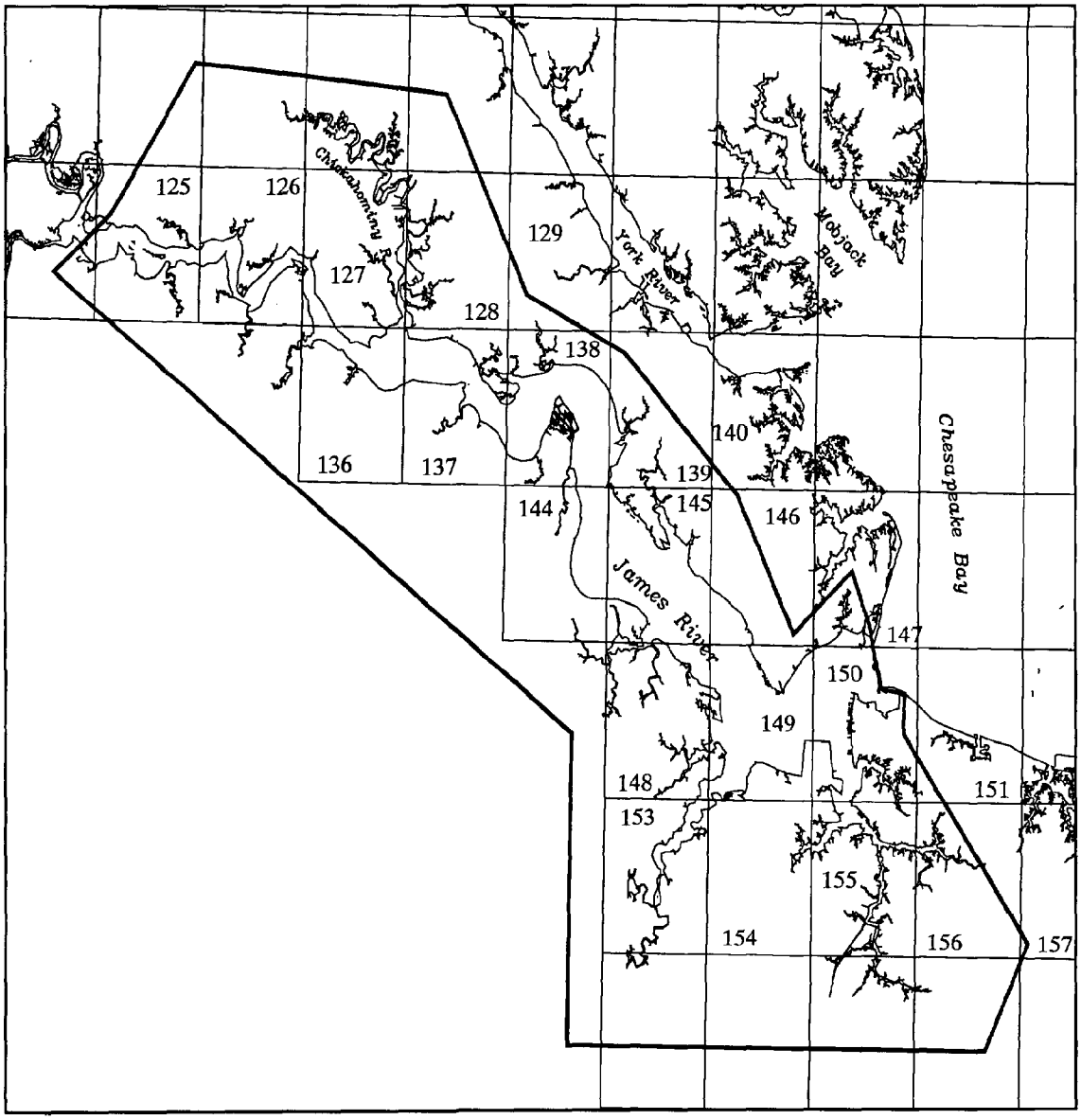

Figure 34. Distribution of SAV in the James River (Section 21) in 1993.

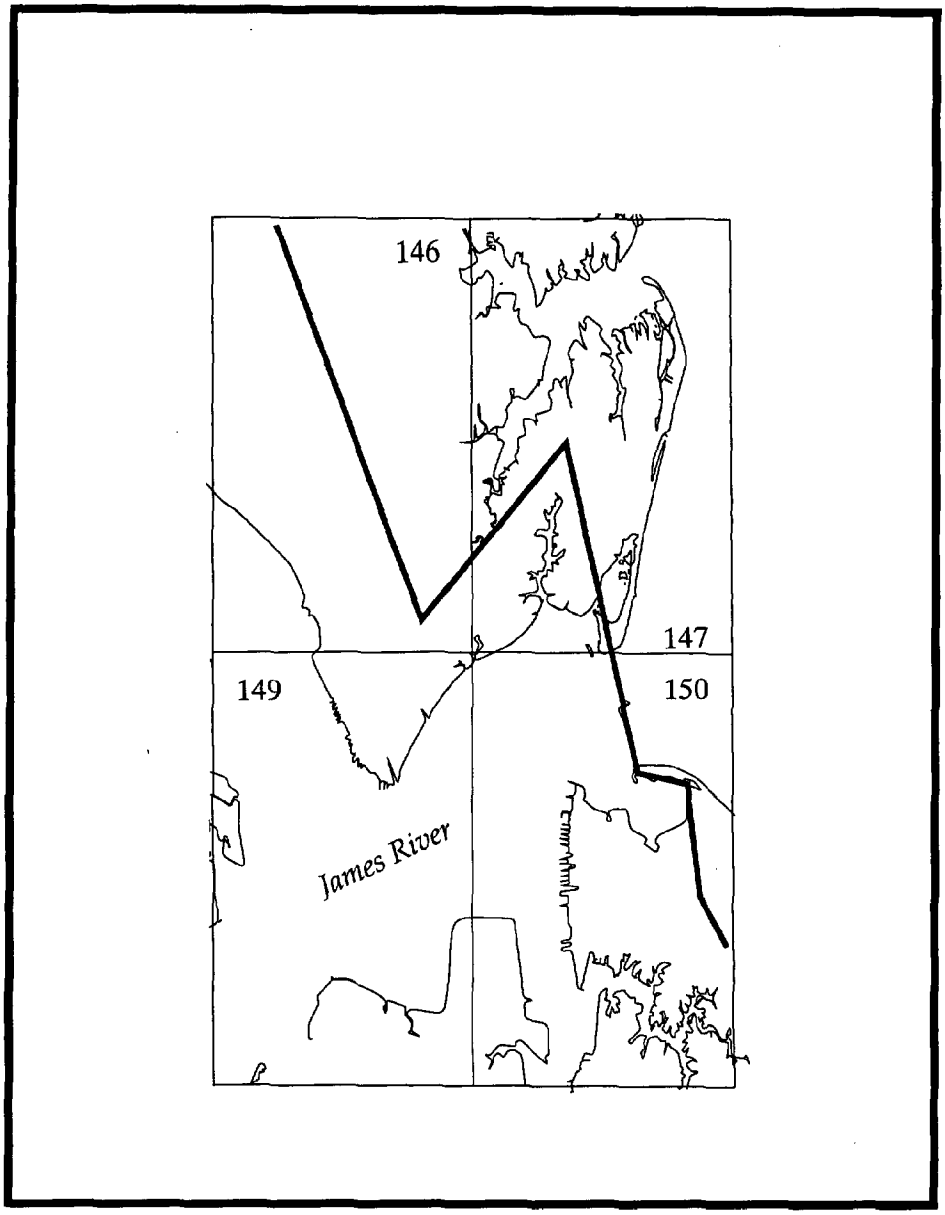

Figure 35. Detail of Figure 34 showing the distribution of SAV in the James River in 1993.

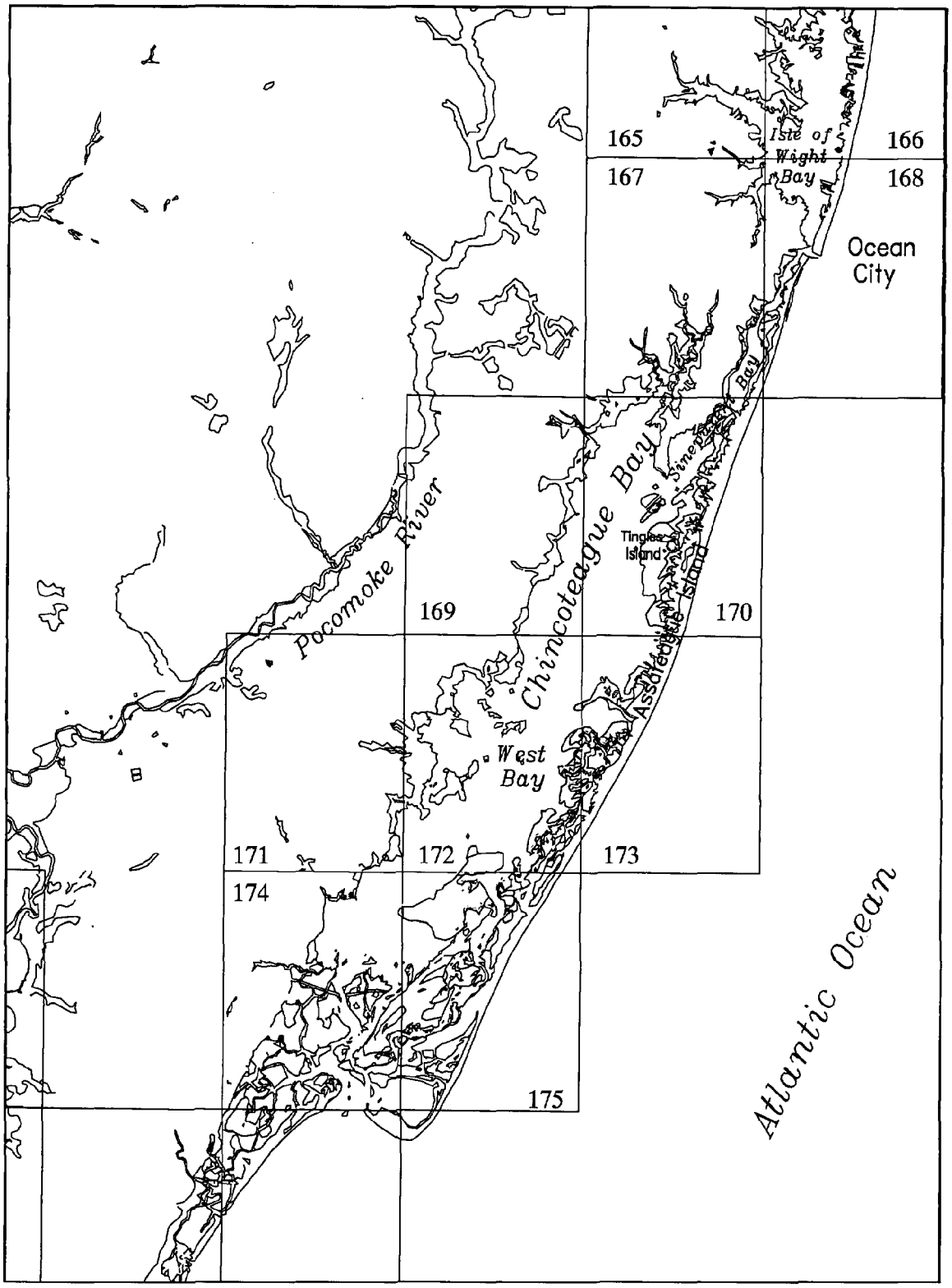

Figure 36. Distribution of SAV in Chincoteague Bay in 1993.

in the earlier surveys from 1986 through 1992. They were located west of the northern end of Chincoteague Island; west of the Tingles Island area; and in Green Run and West bays. SAV in Isle of Wight and Assawoman bays also remains present on the eastern side adjacent to Ocean City.

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APPENDICES

APPENDIX A

APPENDIX A

Species of Submerged Aquatic Plants Found in Chesapeake Bay and Tributaries Exclusive of Marine Algae (Classification and Nomenclature Derived from: Godfrey and Wooten, 1979, 1981; Harvill et al., 1977, 1981; Kartesz and Kartesz, 1980; Radford et al., 1968; Wood and Imahori, 1965, 1964)

Family	Species	Common name
Characeae (muskgrass)	*Chara braunii* Gm.	Muskgrass
	Chara zeylanica Klein. ex Willd., em.	Muskgrass
	Nitella flexilis (L). Ag., em.	Stonewort
Potamogetonaceae (pondweed)	*Potamogeton perfoliatus* L. var. *bupleuroides* (Fernald) Farwell	Redhead grass
	Potamogeton epihydrus	Leafy pondweed
	Potamogeton pectinatus L.	Sago pondweed
	Potamogeton crispus L.	Curly pondweed
	Potamogeton pusillus L.	Slender pondweed
Ruppiaceae	*Ruppia maritima* L.	Widgeon grass
Zannichelliaceae	*Zannichellia palustris* L.	Horned pondweed
Najadaceae	*Najas guadalupensis* (Sprengel) Magnus	Southern naiad
	Najas gracillima (A. Braun) Magnus	Slender naiad
	Najas minor Allioni	no common name
	Najas flexilis (Willd.) Rostk. & Schmidt	Northern naiad
Hydrocharitaceae (frogbit)	*Vallisneria americana* Michaux	Wild celery, tapegrass
	Elodea canadensis (Michaux)	Common elodea
	Egeria densa Planchon	Water-weed
	Hydrilla verticillata (L.f.) Boyle	Hydrilla
Pontederiaceae (pickerelweed)	*Heteranthera dubia* (Jacquin) MacMillian	Water stargrass
Ceratophyllaceae (coontail)	*Ceratophyllum demersum* L.	Coontail
Trapaceae	*Trapa natans* L.	Water chestnut
Haloragaceae (watermilfoil)	*Myriophyllum spicatum* L.	Eurasian watermilfoil
Zosteraceae	*Zostera marina* (L.)	Eelgrass

APPENDIX B

APPENDIX B

Latitude and Longitude Coordinate Points Defining the 21 Chesapeake Bay Sections and Chincoteague Bay. (For Section Locations and Descriptions See Figure 7 and Table 3.)

Latitude Deg Min	Longitude Deg Min
Sec. 1. Susquehanna Flats	
39 27.00	76 10.00
39 39.15	76 10.00
39 39.15	75 51.00
39 27.50	76 00.00
39 26.50	76 01.31
Sec. 2. Upper Eastern Shore	
39 10.00	76 20.00
39 20.00	76 12.50
39 26.50	76 01.31
39 27.50	76 00.00
39 39.15	75 51.00
39 39.15	75 45.00
39 19.50	75 45.00
39 20.00	76 00.00
39 12.55	76 10.40
39 09.25	76 16.00
Sec. 3. Upper Western Shore	
39 12.40	76 49.00
39 30.00	76 20.00
39 27.00	76 10.00
39 26.50	76 01.31
39 20.00	76 12.50
39 10.00	76 20.00
39 00.00	76 20.00
39 03.50	76 32.30
39 06.82	76 35.40
39 11.15	76 40.00

Latitiude Deg Min	Longitude Deg Min
Sec. 4. Chester River	
39 00.00	76 20.00
39 10.00	76 20.00
39 09.25	76 16.00
39 12.55	76 10.40
39 20.00	76 00.00
39 19.50	75 45.00
39 05.00	75 45.00
39 05.00	76 00.00
38 57.10	76 11.85
39 00.00	76 19.10
38 50.00	76 01.65
39 05.00	76 00.00
39 05.00	75 45.00
38 45.00	75 45.00
38 45.00	75 50.00
38 21.93	75 55.00
38 25.00	76 06.80
Sec. 5 Central Western Shore	
38 42.90	76 35.00
38 55.00	76 37.50
39 12.40	76 49.00
39 11.15	76 40.00
39 06.82	76 35.40
39 03.50	76 32.30
39 00.00	76 20.00
38 55.00	76 25.00
38 45.00	76 25.00

Latitude Deg Min	Longitude Deg Min
Sec. 6 Eastern Bay	
38 45.00	76 25.00
38 55.00	76 25.00
39 00.00	76 20.00
39 00.00	76 19.10
38 57.10	76 11.85
39 05.00	76 00.00
38 50.00	76 01.65
38 44.10	76 10.50
38 50.00	76 16.50
38 45.00	76 20.00
38 42.50	76 20.50
Sec. 7. Choptank River	
38 23.50	76 20.00
38 45.00	76 25.00
38 42.50	76 20.50
38 45.00	76 20.00
38 50.00	76 16.50
38 44.10	76 10.50
38 50.00	76 01.65
39 05.00	76 00.00
39 05.00	75 45.00
38 45.00	75 45.00
38 45.00	75 50.00
38 21.93	75 55.00
38 25.00	76 06.80
Sec. 8. Patuxent River	
38 15.00	76 25.45
38 35.00	77 00.00
38 58.00	76 45.00
38 55.00	76 37.50
38 42.90	76 35.00
38 30.00	76 32.30
38 21.66	76 23.50

Latitiude Deg Min	Longitude Deg Min
38 18.00	76 22.83
Sec. 9. Middle Western Shore	
38 02.85	76 19.40
38 05.00	76 21.54
38 15.00	76 25.45
38 18.00	76 22.83
38 21.66	76 23.50
38 30.00	76 32.30
38 42.90	76 35.00
38 45.00	76 25.00
38 23.50	76 20.00
38 05.00	76 10.00
Sec. 10. Lower Potomac River	
37 53.40	76 14.45
37 55.50	76 18.15
37 53.85	76 28.00
38 06.15	76 53.00
38 15.00	77 06.40
38 20.00	77 09.40
38 24.20	77 14.08
38 35.00	77 00.00
38 15.00	76 25.45
38 05.00	76 21.54
38 02.85	76 19.40
38 05.00	76 10.00
37 50.00	76 10.00
Sec. 11. Upper Potomac River	
38 15.00	77 06.40
38 20.00	77 24.80
38 27.65	77 25.00
39 01.80	77 17.10
38 58.00	76 45.00
38 35.00	77 00.00

Latitude Deg Min	Longitude Deg Min
Sec. 11. Upper Potomac River (continued)	
38 24.20	77 14.08
38 20.00	77 09.40
Sec. 12. Middle Eastern Shore	
38 11.10	76 13.30
38 23.50	76 20.00
38 25.00	76 06.80
38 21.93	75 55.00
38 45.00	75 50.00
38 40.00	75 37.00
38 00.00	75 38.00
38 00.73	75 49.50
37 57.10	75 50.30
37 55.00	75 55.10
38 11.70	75 59.00
38 13.60	76 05.83
Sec. 13. Mid-Bay Island Complex	
37 45.00	75 58.30
37 50.00	76 10.00
38 05.00	76 10.00
38 11.10	76 13.30
38 13.60	76 05.83
38 11.70	75 59.00
37 55.00	75 55.10
Sec. 14. Lower Eastern Shore	
37 00.00	75 58.95
37 20.00	76 10.00
37 38.75	76 10.00
37 50.00	76 10.00
37 45.00	75 58.30
37 55.00	75 55.10
37 57.10	75 50.30
38 00.73	75 49.50
38 00.00	75 38.00
38 00.00	75 30.00
37 46.45	75 39.30
37 20.00	75 55.50
Sec. 15. Reedville	
37 38.75	76 10.00
37 37.40	76 21.40
37 38.05	76 23.50
37 44.35	76 23.00
37 48.00	76 28.00
37 53.85	76 28.00
37 55.50	76 18.15
37 53.40	76 14.45
37 50.00	76 10.00
Sec. 16. Rappahannock River Complex	
37 26.50	76 10.00
37 25.00	76 18.08
37 28.00	76 20.00
37 29.00	76 25.00
37 32.00	76 35.00
37 49.15	76 48.00
37 53.73	76 49.65
37 58.00	76 45.45
37 48.00	76 28.00
37 44.35	76 23.00
37 38.05	76 23.50
37 37.40	76 21.40
37 38.75	76 10.00
Sec. 17. New Point Comfort Region	
37 17.45	76 16.16
37 19.45	76 16.62

Latitude Deg Min	Longitude Deg Min
Sec. 17. New Point Comfort Region (continued)	
37 20.00	76 17.40
37 21.00	76 17.40
37 22.25	76 19.50
37 25.00	76 18.00
37 26.50	76 10.00
37 20.00	76 10.00
Sec. 18. Mobjack Bay Complex	
37 17.00	76 19.33
37 16.25	76 22.50
37 17.00	76 25.42
37 16.50	76 28.50
37 20.00	76 31.88
37 25.75	76 31.00
37 29.00	76 25.00
37 28.00	76 20.00
37 25.00	76 18.00
37 22.25	76 19.50
37 21.00	76 17.40
37 20.00	76 17.40
37 19.30	76 16.62
37 17.45	76 16.16
Sec 19. York River	
37 14.00	76 22.50
37 13.25	76 24.00
37 12.50	76 27.50
37 07.30	76 28.20
37 14.00	76 36.50
37 16.72	76 43.65
37 26.29	76 49.77
37 30.55	76 40.00
37 28.56	76 35.00
37 20.00	76 31.88
37 16.50	76 28.50
37 17.00	76 25.42
37 16.25	76 22.50
37 17.00	76 19.33
37 14.00	76 19.33
Sec. 20. Lower Western Shore	
36 49.11	75 58.05
36 45.75	76 07.00
36 55.85	76 16.00
36 57.79	76 16.00
36 58.00	76 17.70
37 01.05	76 18.52
37 03.68	76 19.80
37 00.60	76 24.00
37 07.30	76 28.20
37 12.50	76 27.50
37 13.25	76 24.00
37 14.00	76 22.50
37 14.00	76 19.33
37 17.00	76 19.33
37 17.45	76 16.16
37 20.00	76 10.00
37 00.00	75 58.95
Sec. 21. James River	
36 45.75	76 07.00
36 40.00	76 10.00
36 40.00	76 30.00
36 40.00	76 40.00
36 55.63	76 40.00
37 17.30	77 18.00
37 20.15	77 14.00
37 27.45	77 08.10
37 26.29	76 49.77
37 16.72	76 43.65
37 14.00	76 36.50

Latitude Deg Min	Longitude Deg Min	Latitiude Deg Min	Longitude Deg Min
Sec. 21. James River (continued)		Chincoteague Bay	
37 07.30	76 28.20	37 52.50	75 30.00
37 00.60	76 24.00	38 00.00	75 30.00
37 03.68	76 19.80	38 07.50	75 22.50
37 01.05	76 18.52	38 15.00	75 17.50
36 58.00	76 17.70	38 15.00	75 15.00
36 57.79	76 16.00	38 22.50	75 15.00
36 55.85	76 16.00	38 30.00	75 10.00
		38 30.00	75 02.50
		38 22.50	75 02.50
		38 15.00	75 07.50
		38 07.50	75 10.00
		38 00.00	75 15.00
		37 52.50	75 20.00
		37 51.00	75 22.30
		37 51.00	75 30.00

APPENDIX C

USGS 7.5 Minute Quadrangles for Chesapeake Bay and Chincoteague Bay Showing Distribution, Abundance, and Ground Truthing of SAV in 1993. [Boundaries of Individual SAV Beds Are Delineated by Solid Lines. Each Bed Is Identified with an Unique Two Letter (AA-ZA, AB-ZB, etc.) and One Number (1-4) Designation. These Numbers Represent the Density Classification Discussed in the Text and Figure 6, i.e. 1 = <10%; 2 = 10-40%; 3 = 40-70%; 4 = 70-100%. Ground Truthing is Represented by Symbols and Species Codes which Are Explained in the Legend.]

KEY FOR 1993 SAV MAPS

SPECIES

Zm	*Zostera marina* (eelgrass)
Rm	*Ruppia maritima* (widgeon grass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)
Ppf	*Potamogeton perfoliatus* (redhead-grass)
Ppc	*Potamogeton pectinatus* (sago pondweed)
Zp	*Zannichellia palustris* (horned pondweed)
N	*Najas* spp. (naiad)
Ec	*Elodea canadensis* (common elodea)
Va	*Vallisneria americana* (wild celery)
Tn	*Trapa natans* (water chestnut)
Pe	*Potamogeton epihydrus* (leafy pondweed)
Hv	*Hydrilla verticillata* (hydrilla)
Hd	*Heteranthera dubia* (water stargrass)
Pcr	*Potamogeton crispus* (curly pondweed)
Cd	*Ceratophyllum demersum* (coontail)
Ppu	*Potamogeton pusillus* (slender pondweed)
Ngu	*Najas guadalupensis* (southern naiad)
Ngr	*Najas gracillima* (slender naiad)
C	*Chara* sp. (muskgrass)
Nm	*Najas minor*
Nfl	*Najas flexilis* (northern naiad)
U	Unknown species composition

SURVEY STATIONS

- ▲ VIMS Field Survey
- ✳ Harford Community College
- ● Citizens Field Observation
- ★ U.S. Fish and Wildlife Service
- ◆ U.S. Geological Survey

Indicates 'NO SAV' polygon

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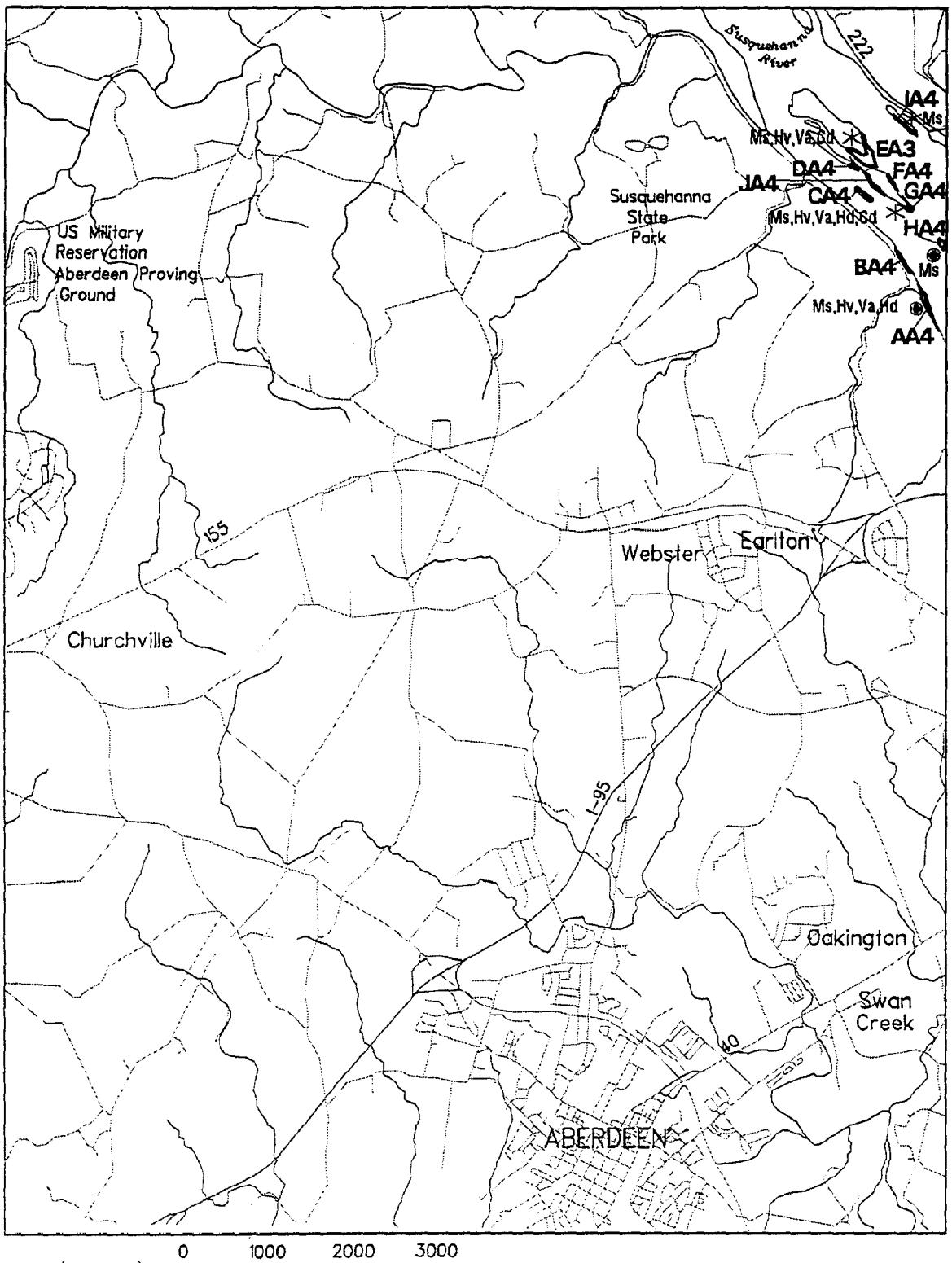
Aberdeen, Md.(002)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

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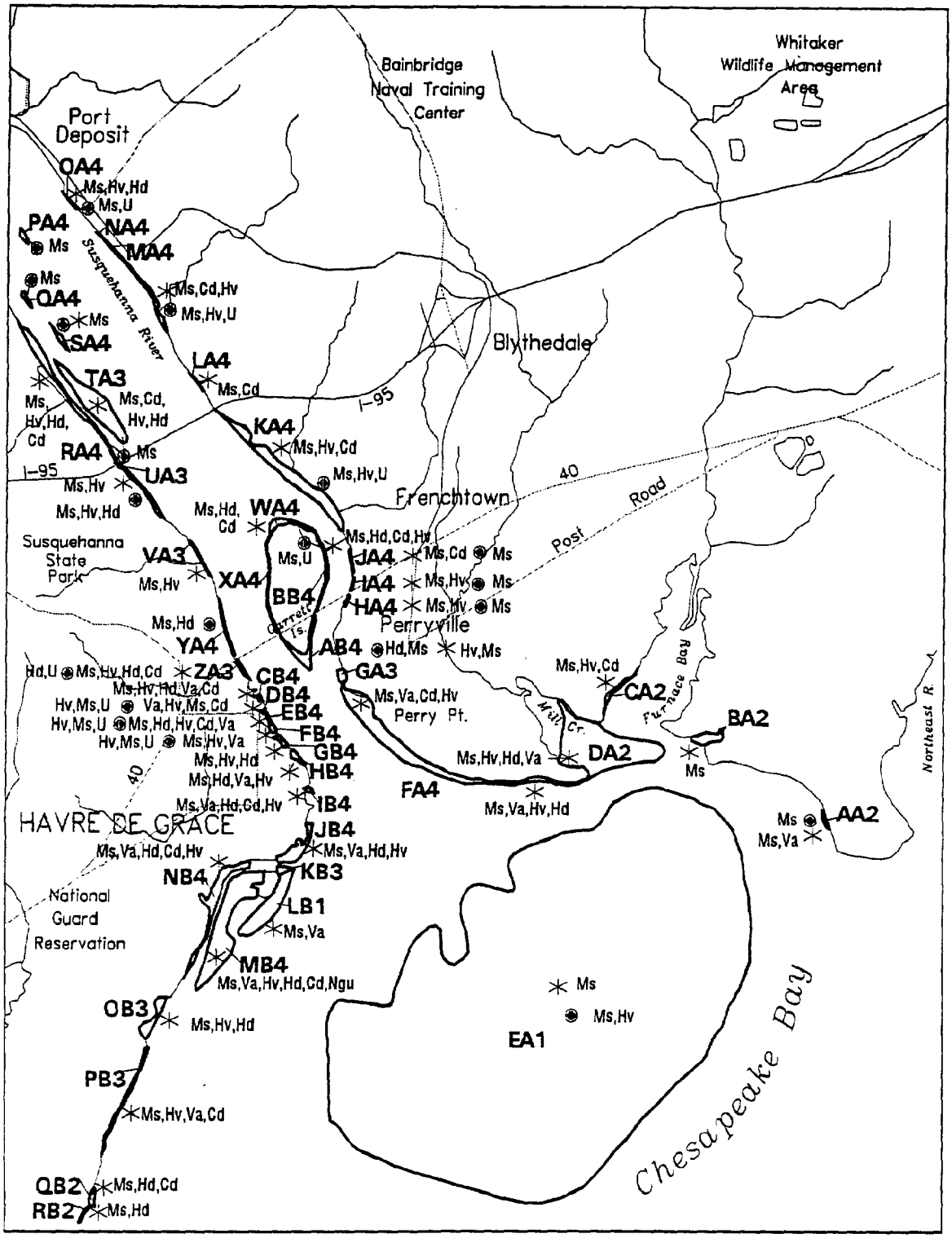
Havre de Grace, Md.(003)



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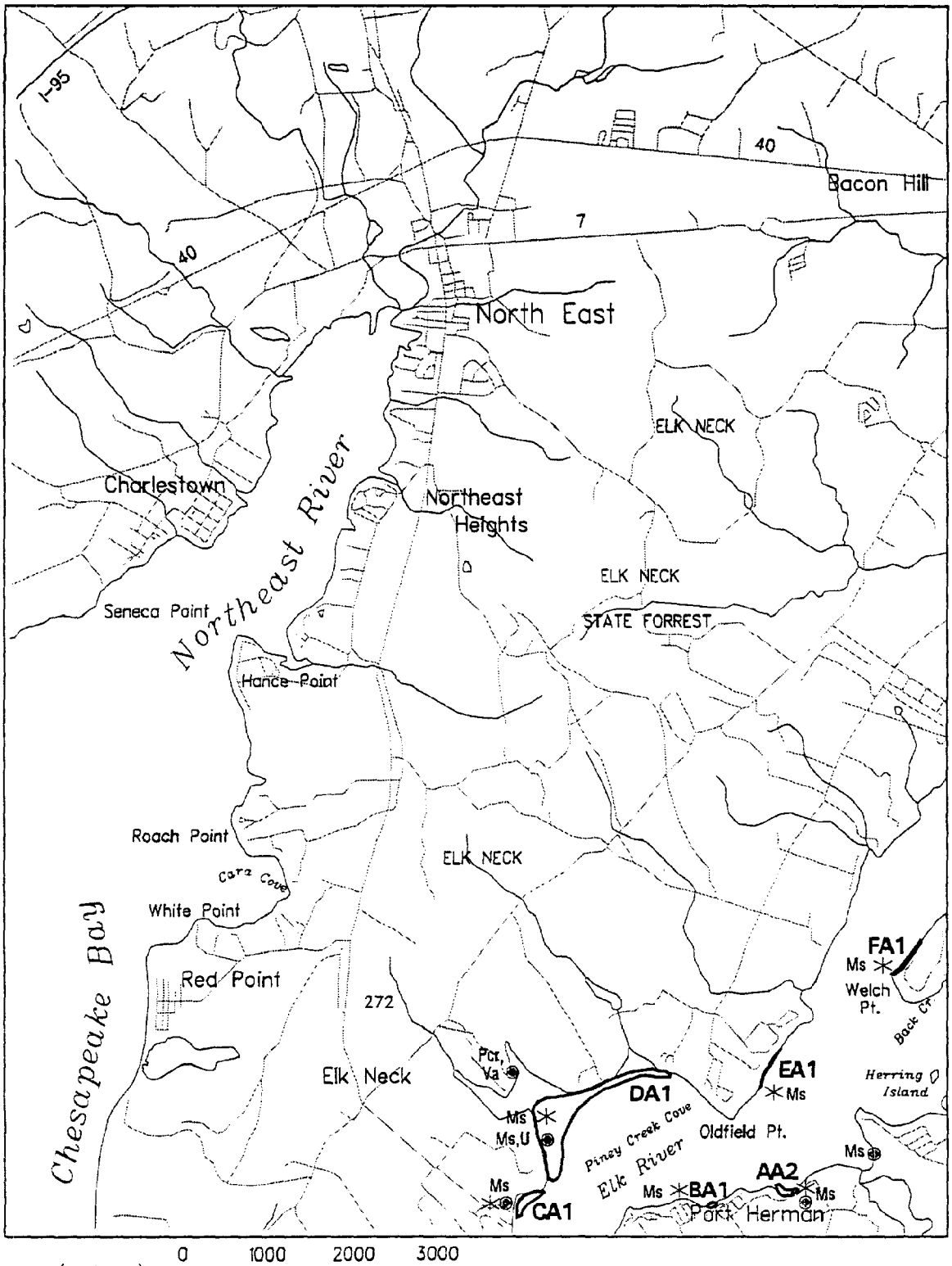

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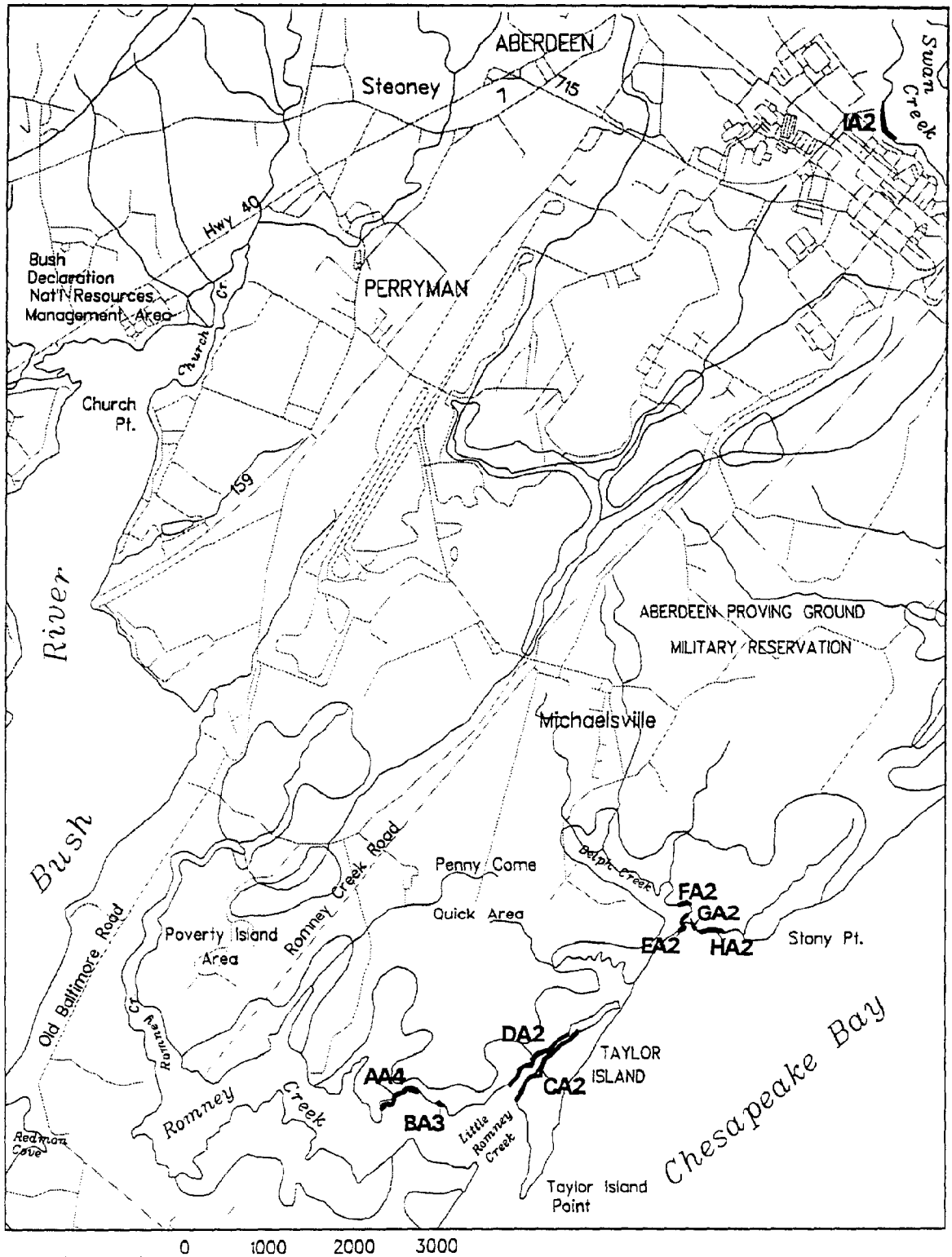

Scale (meters):

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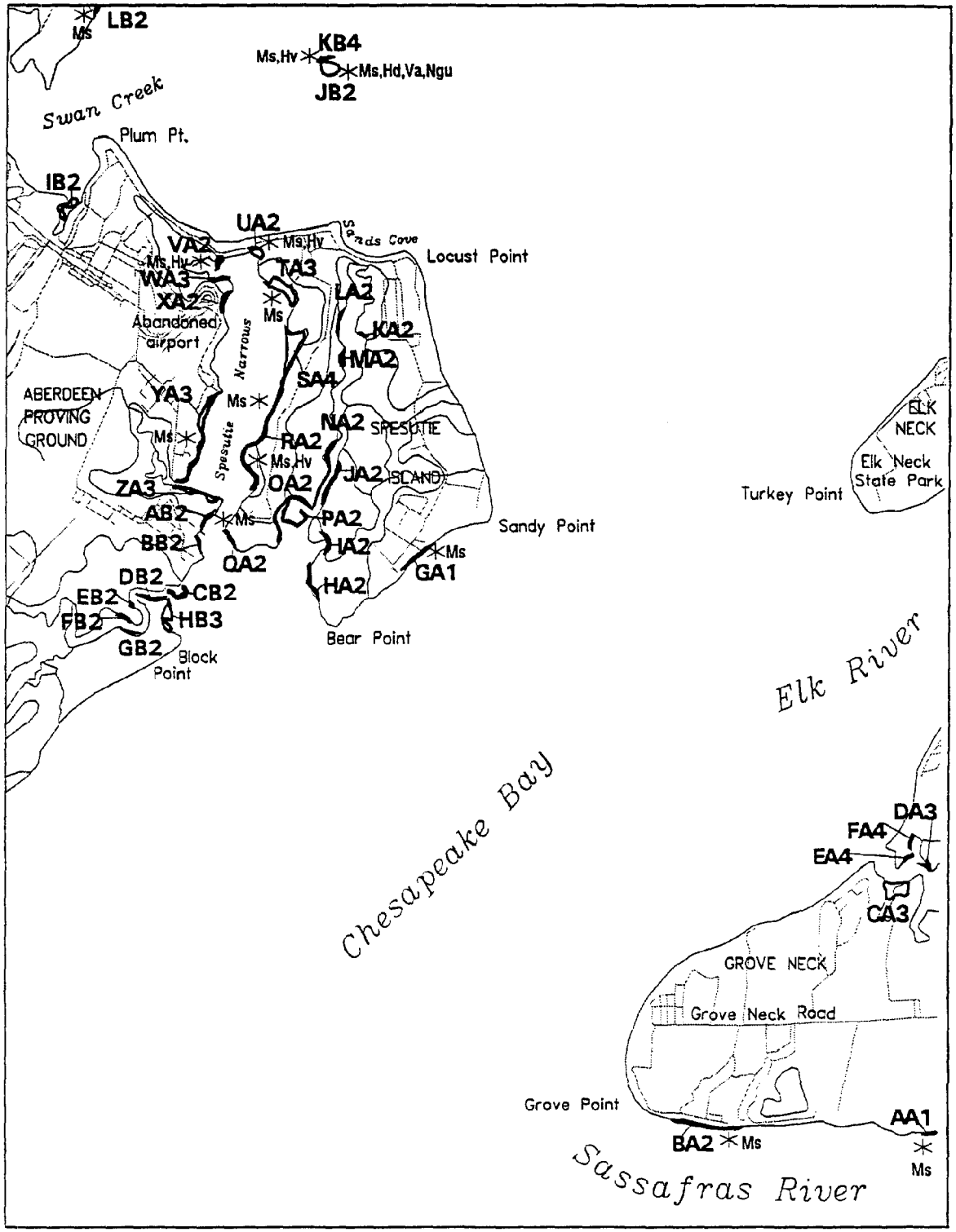

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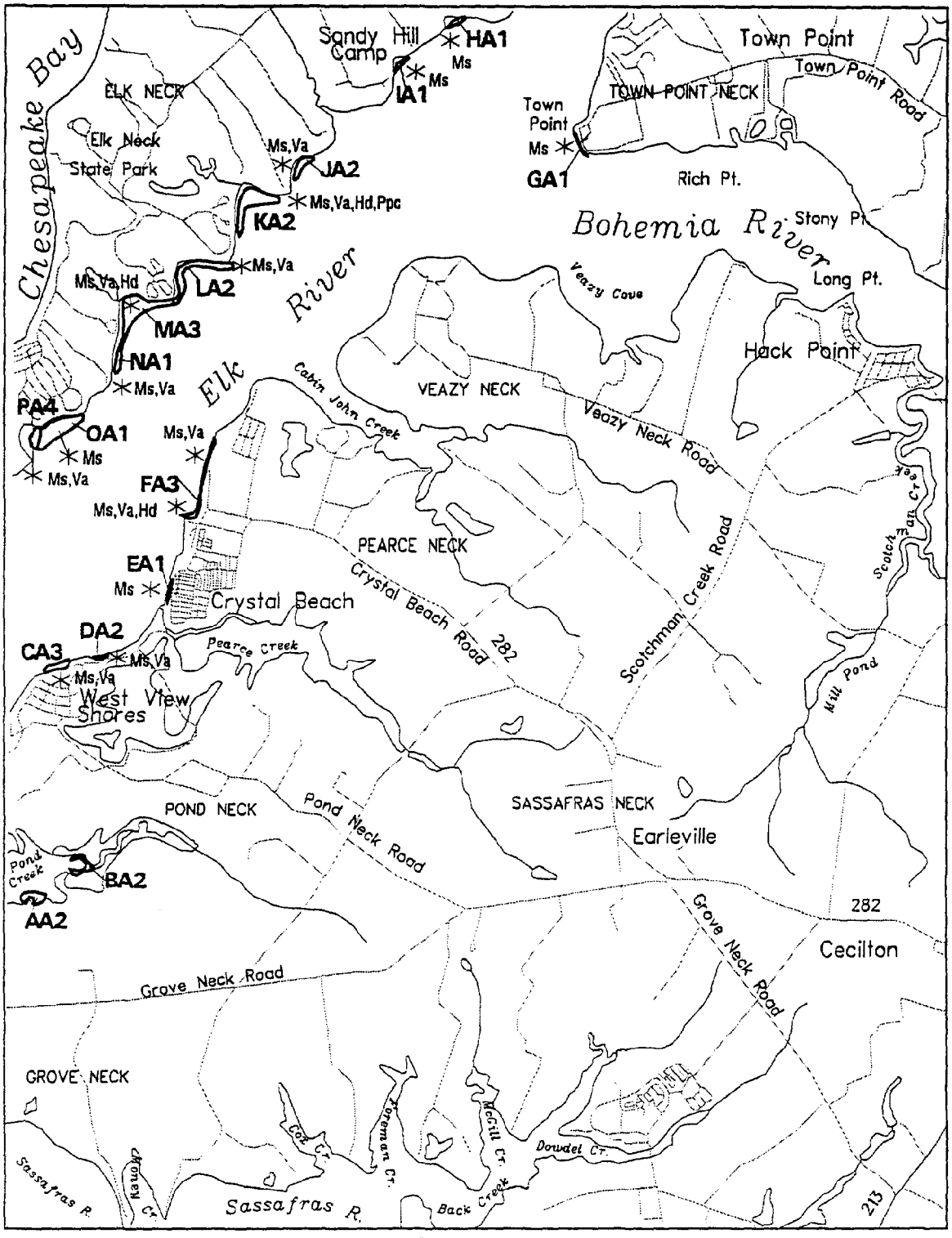

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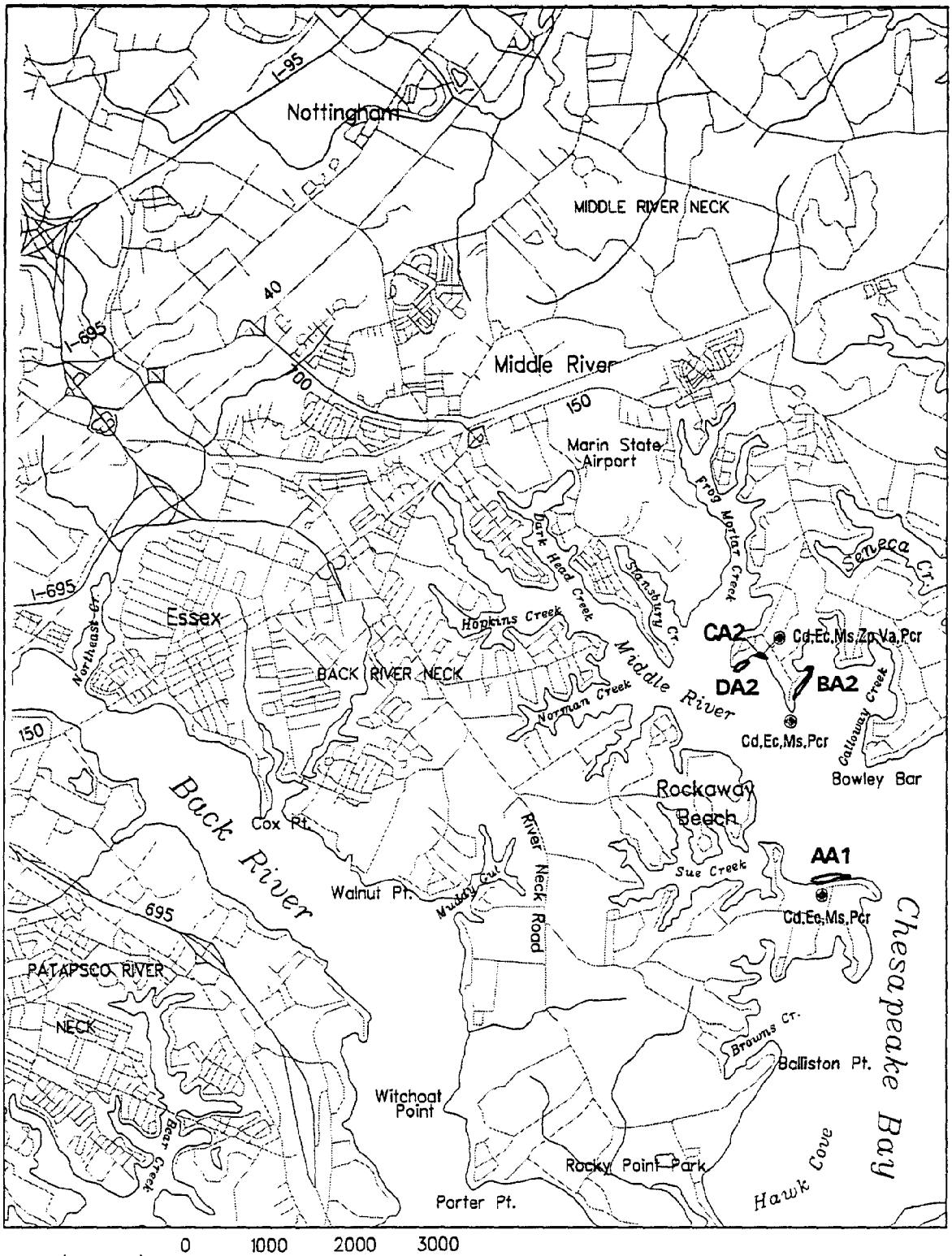

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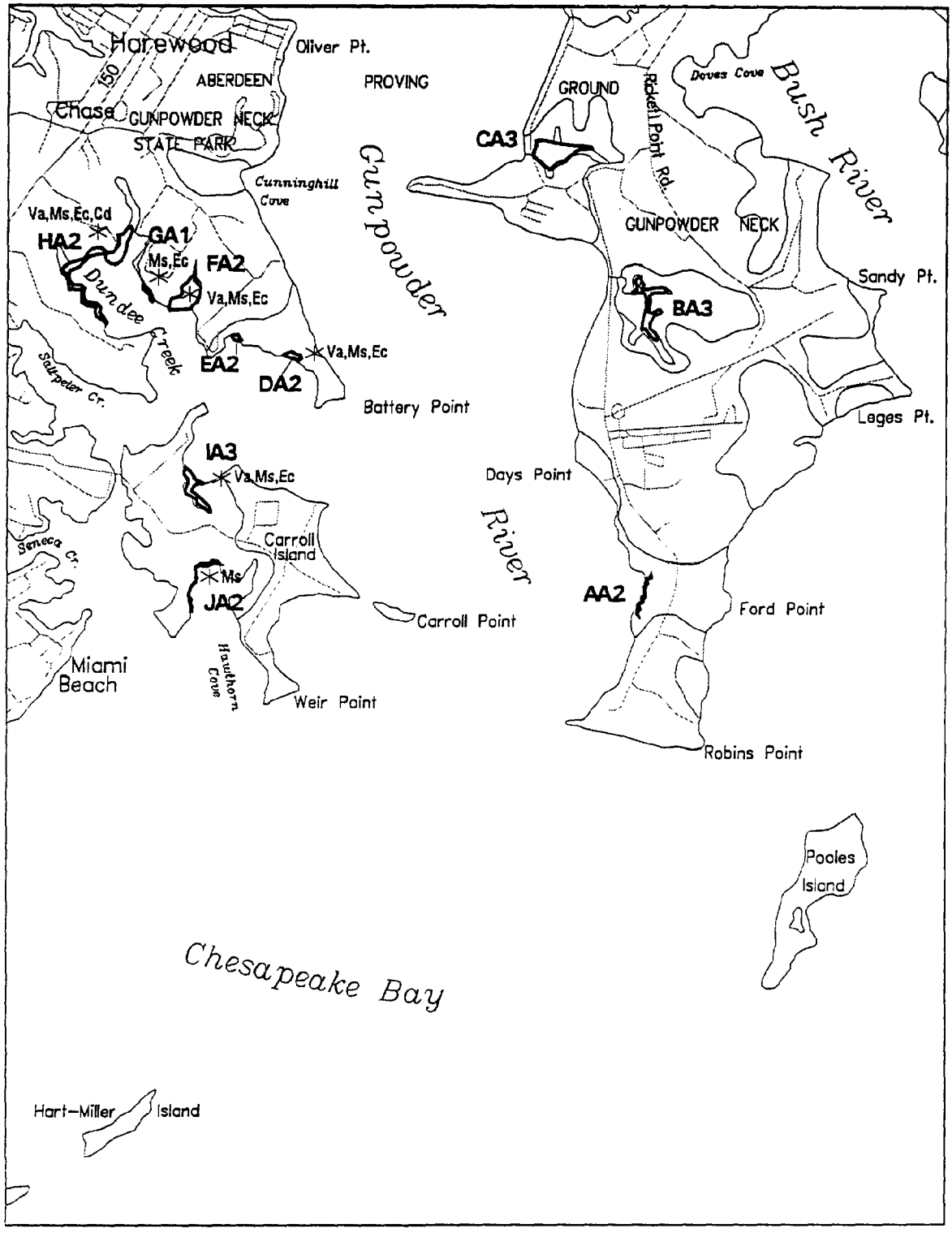

Scale (meters):

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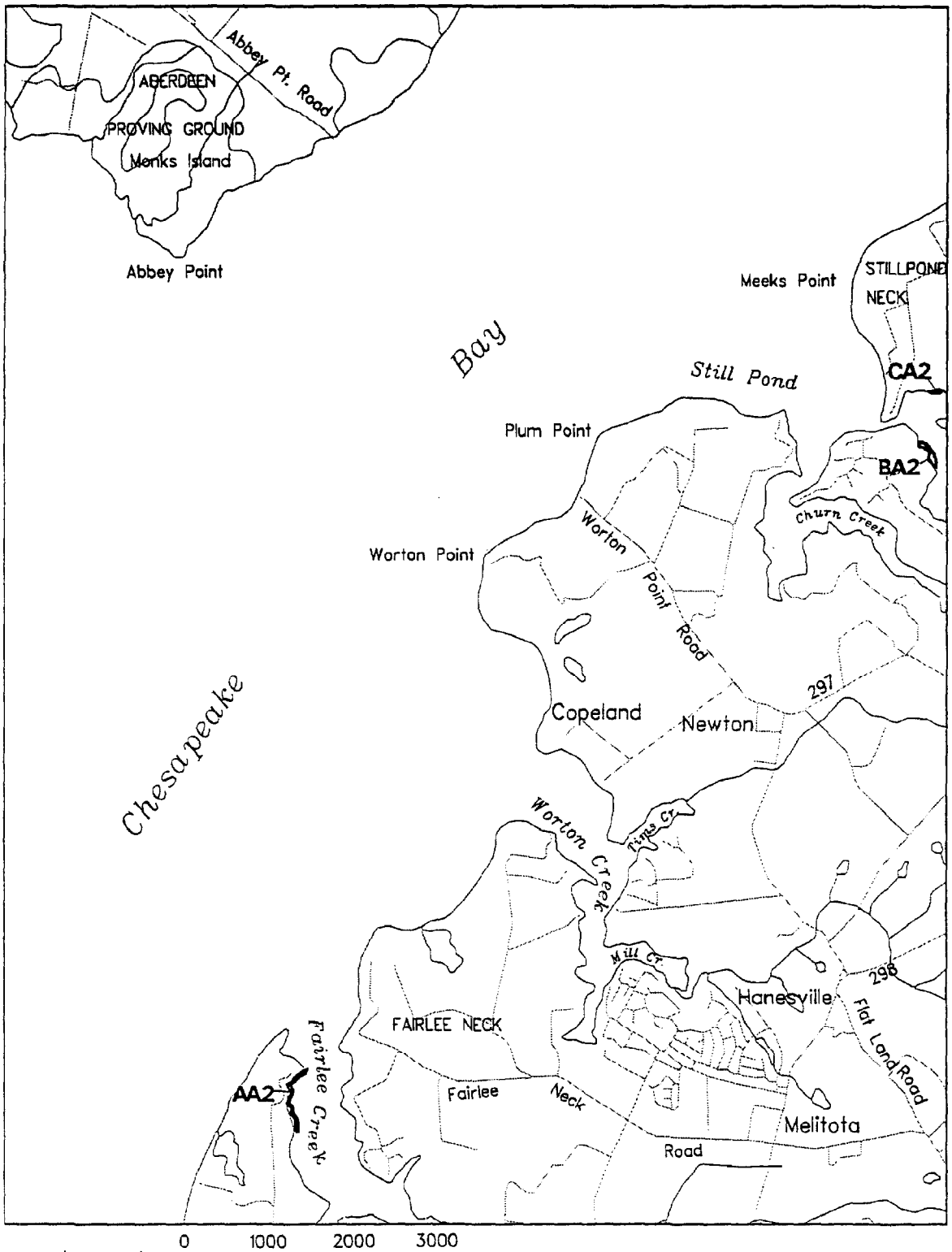

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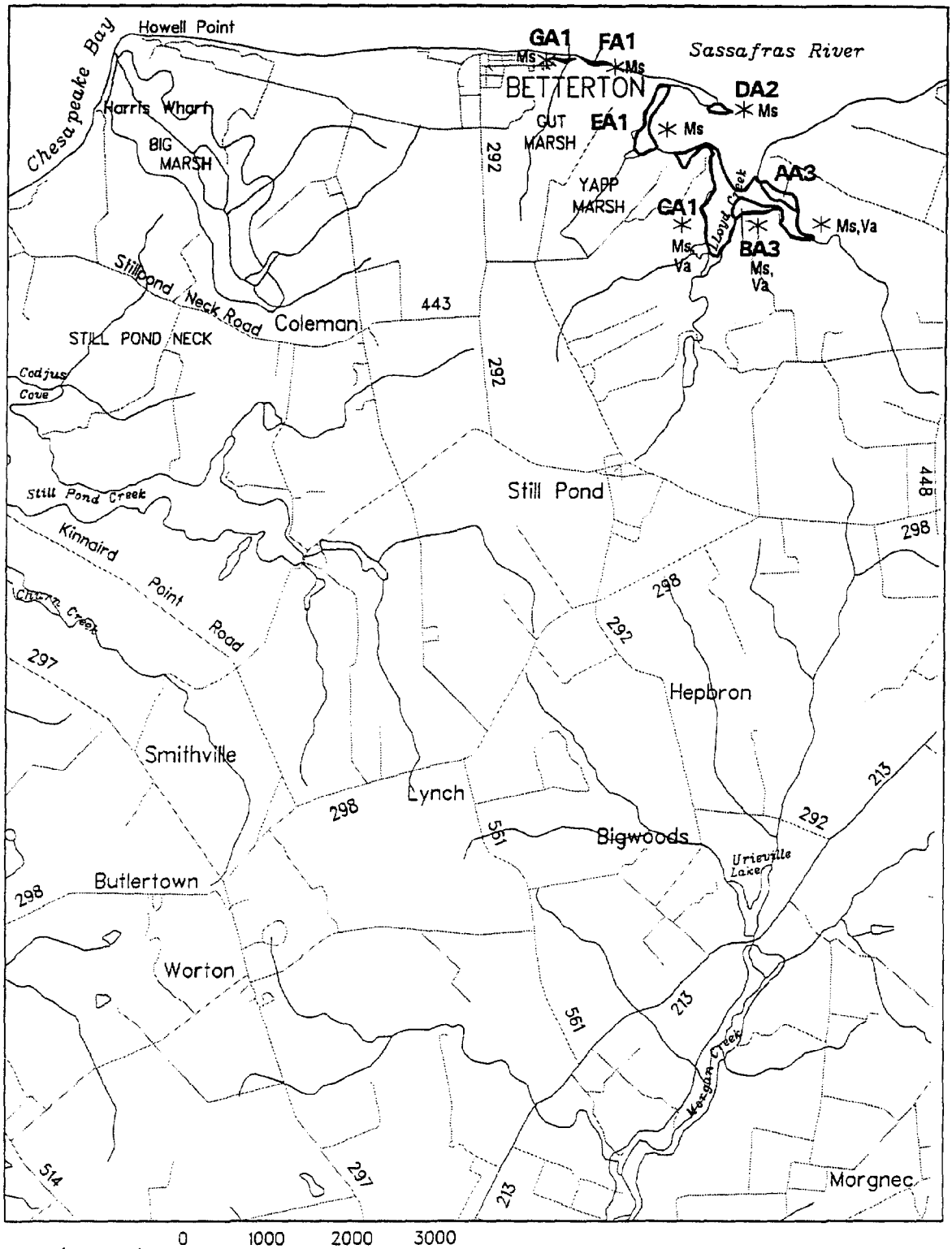

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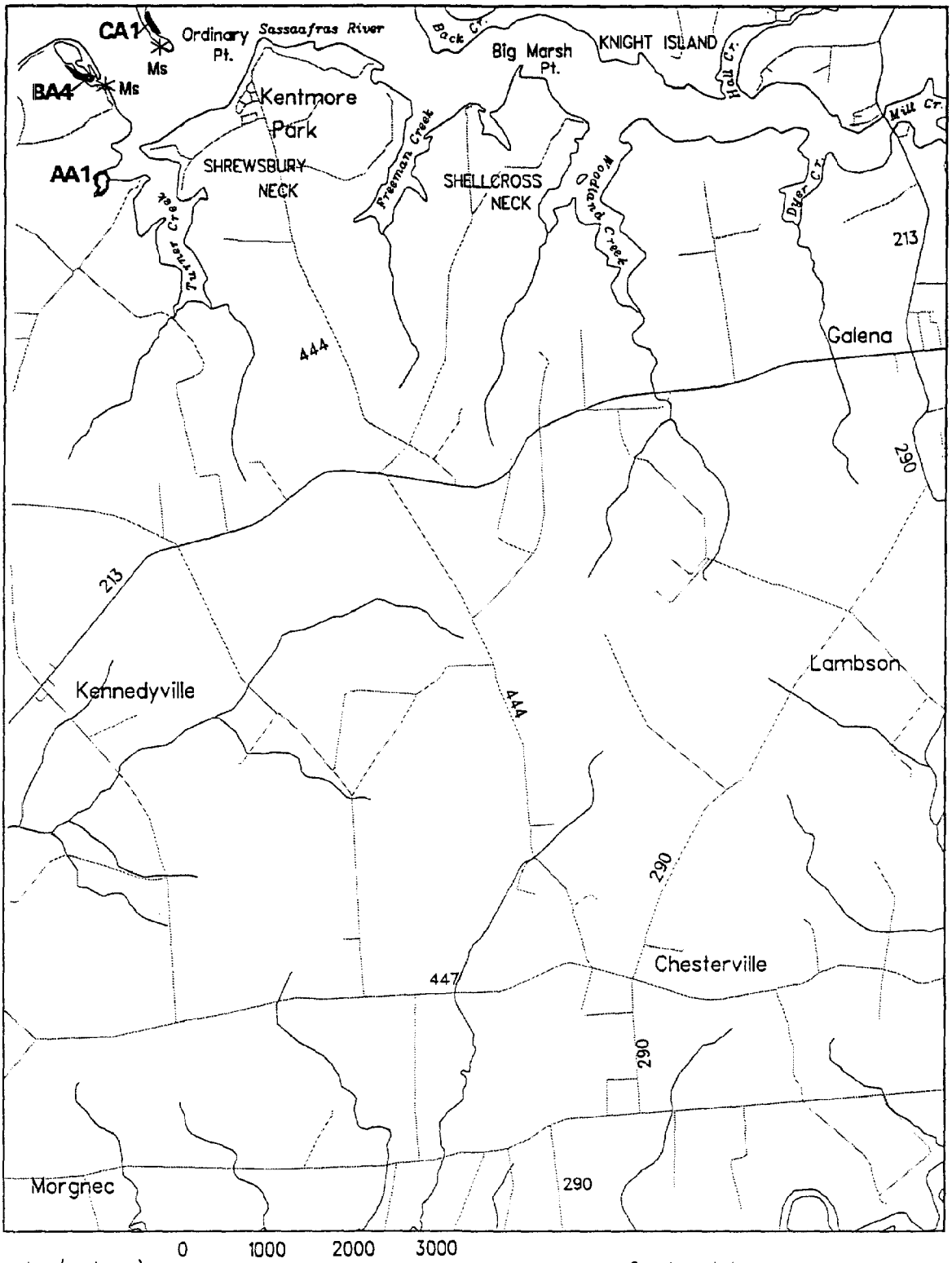

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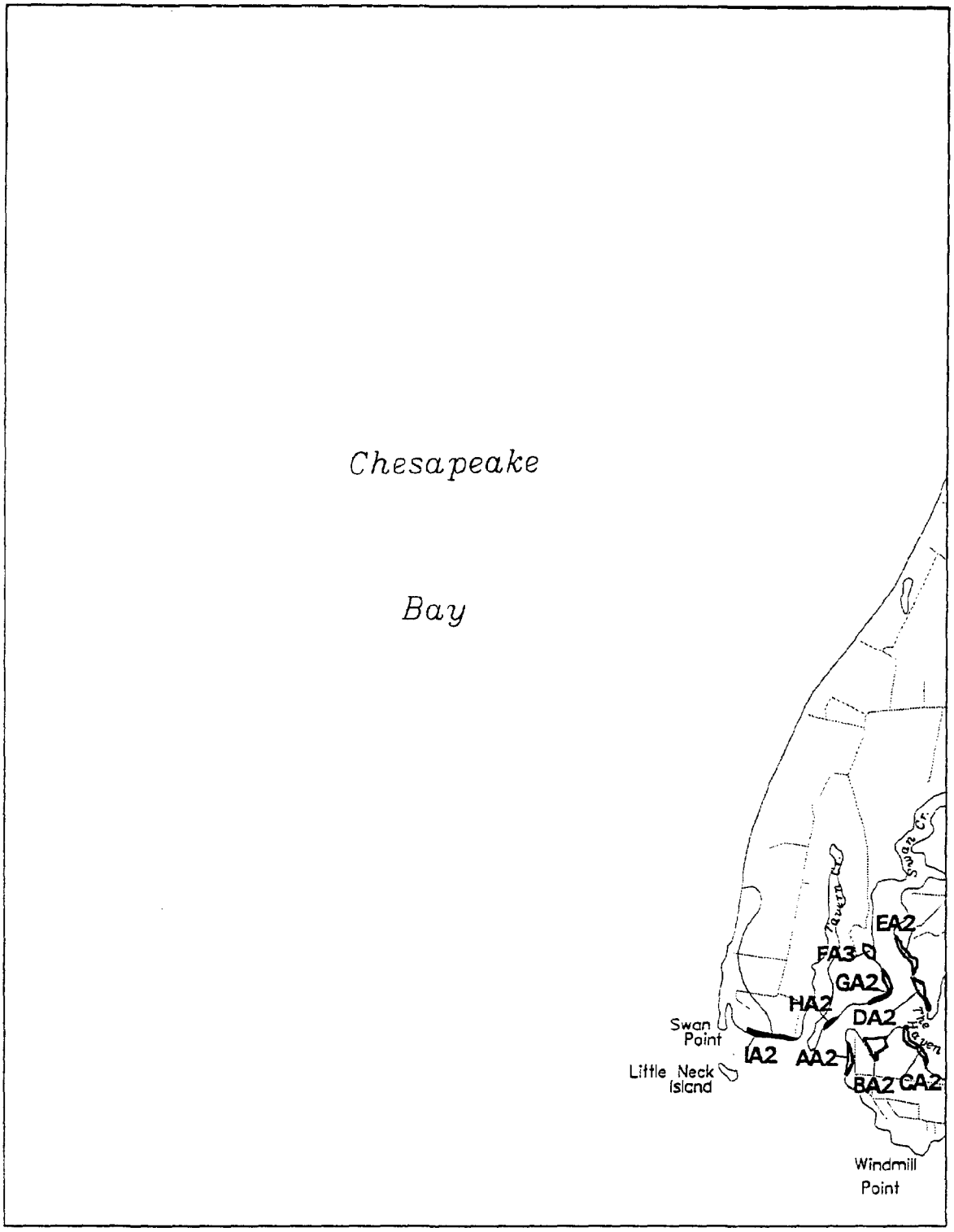

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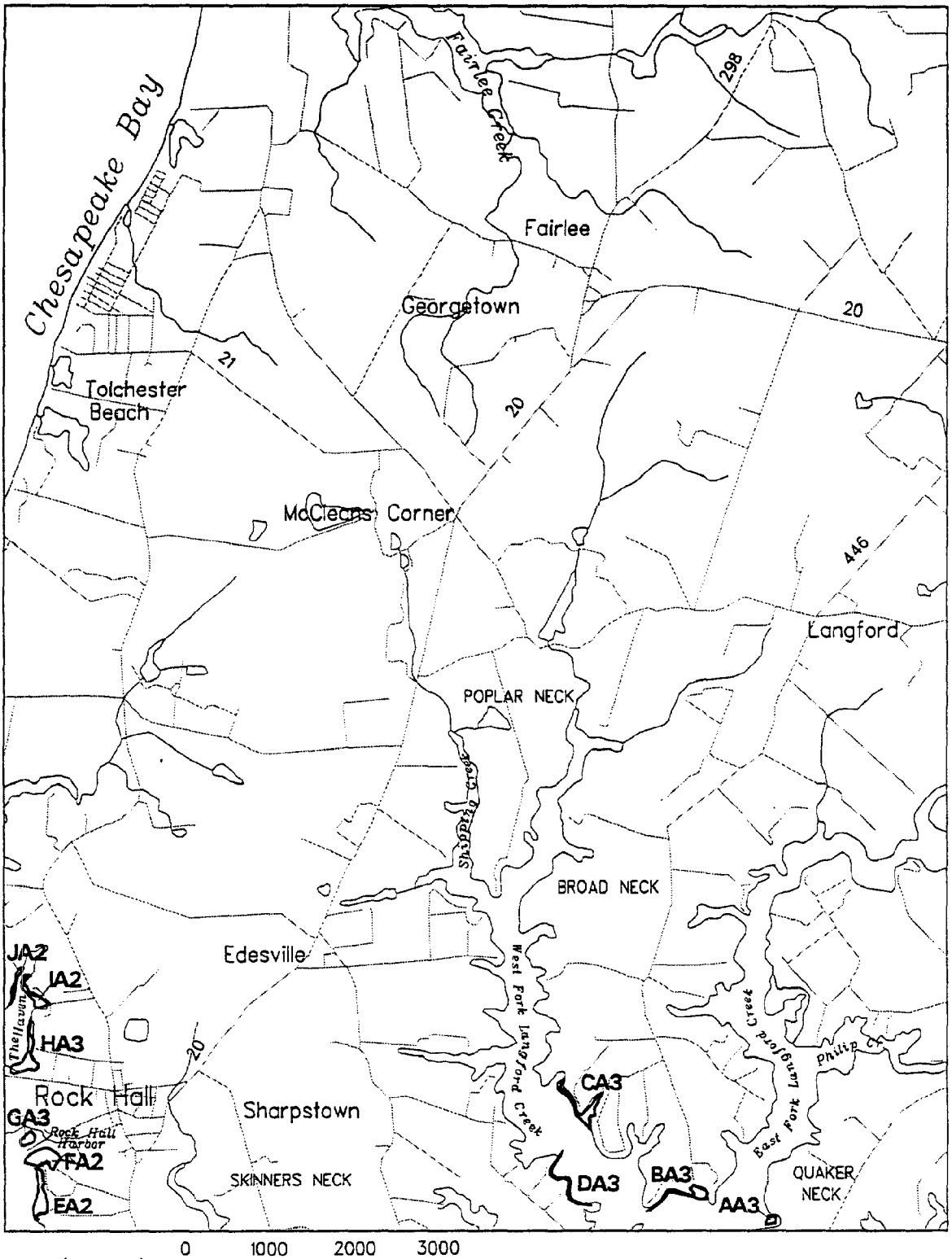

Scale (meters):

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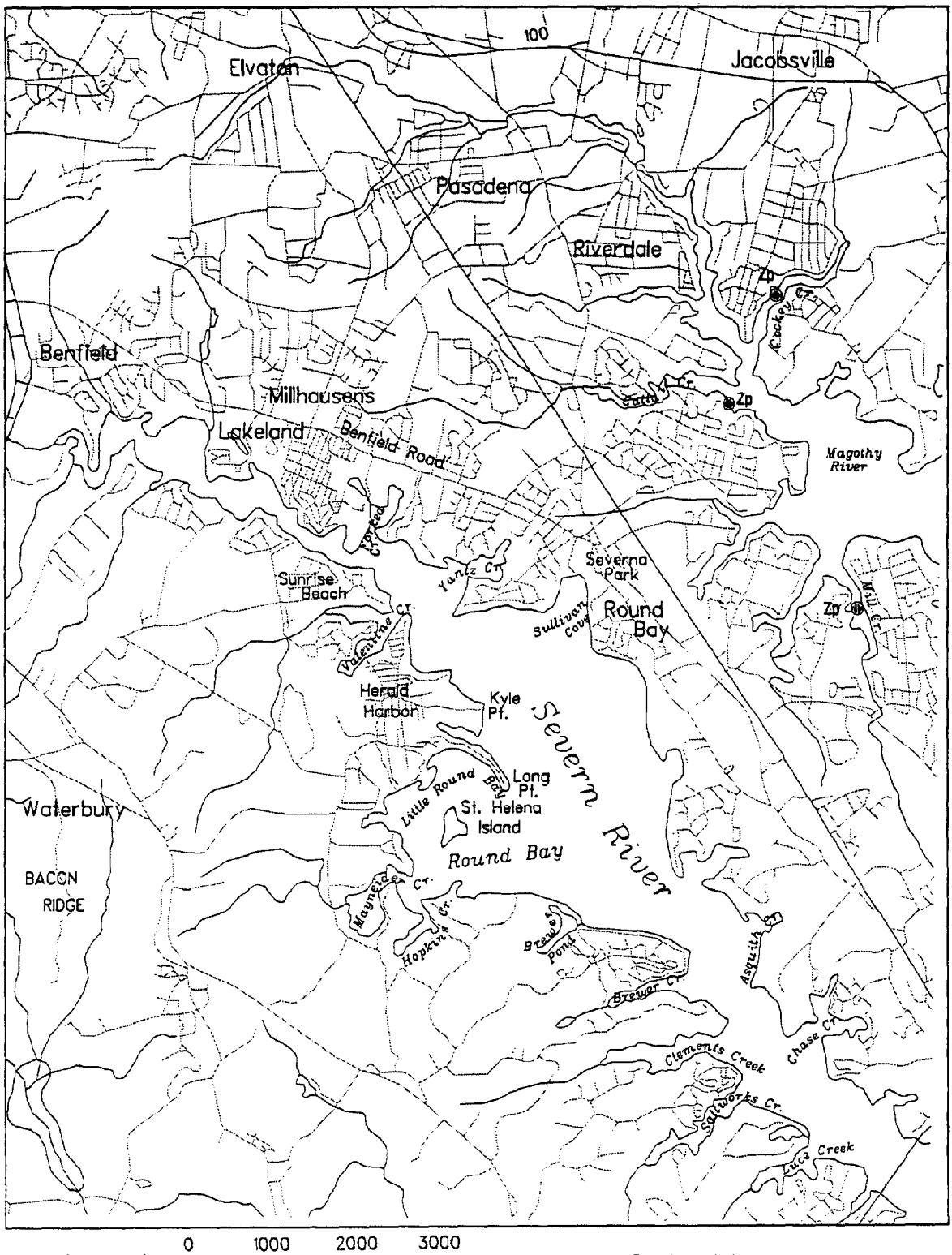

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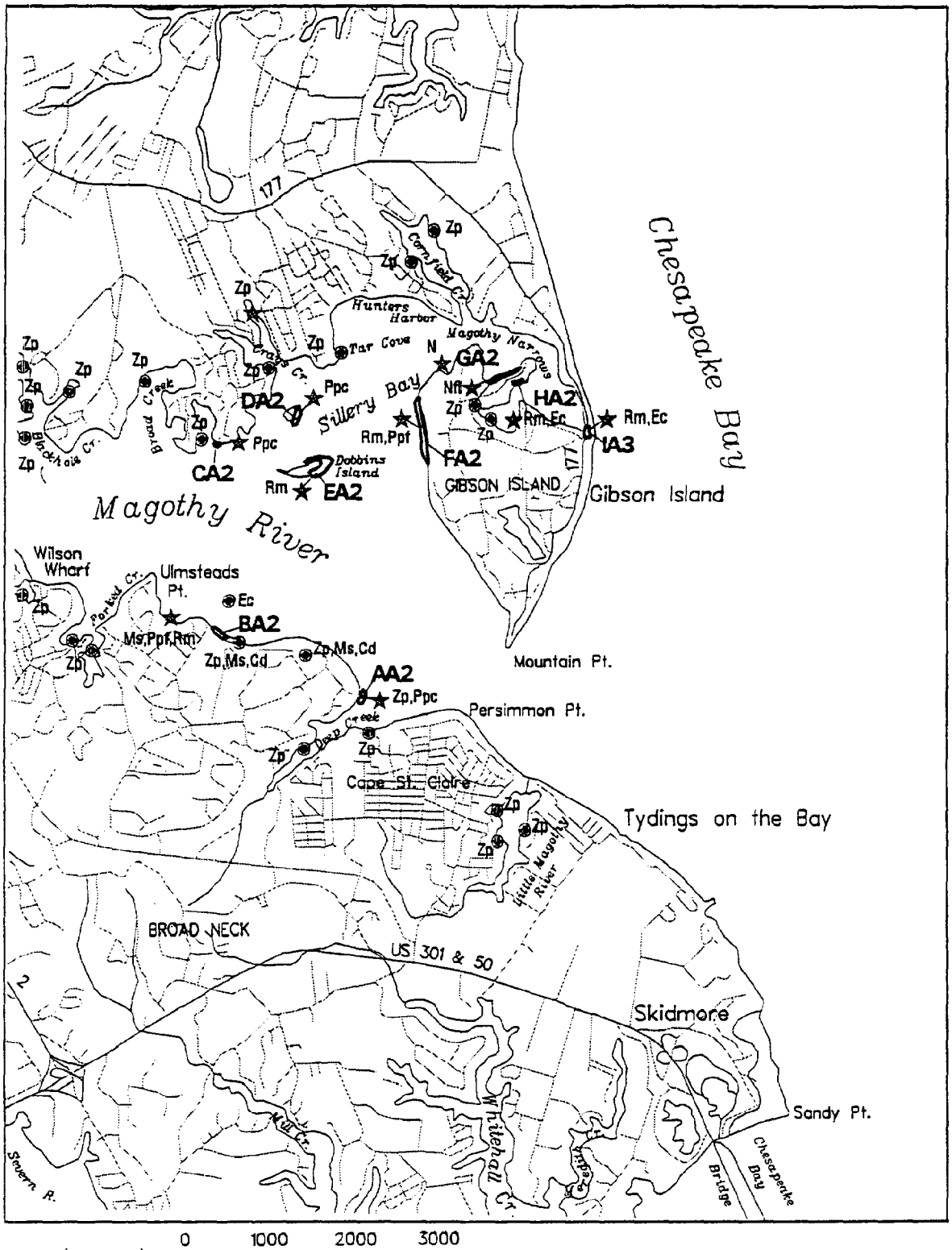

Scale (meters):

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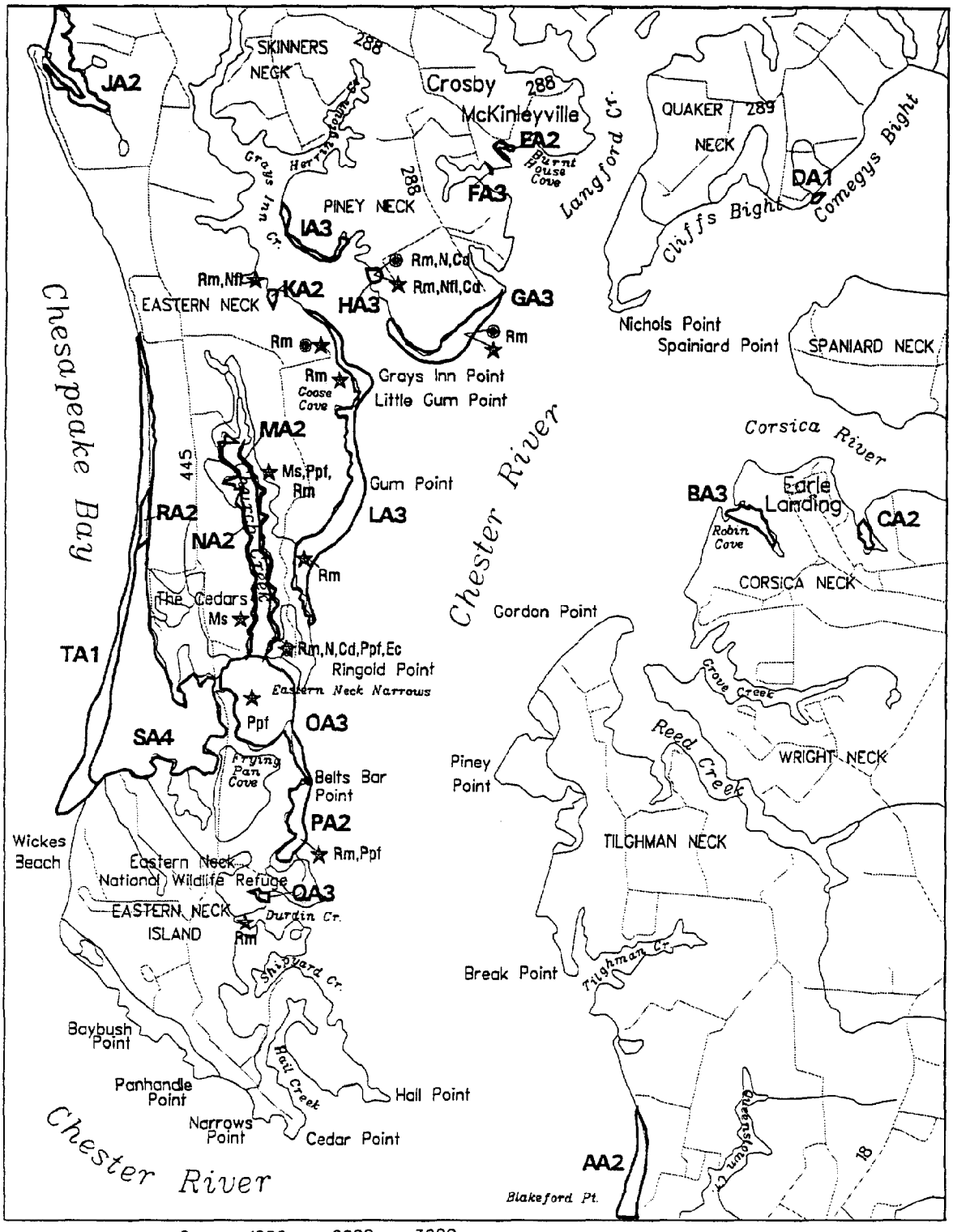

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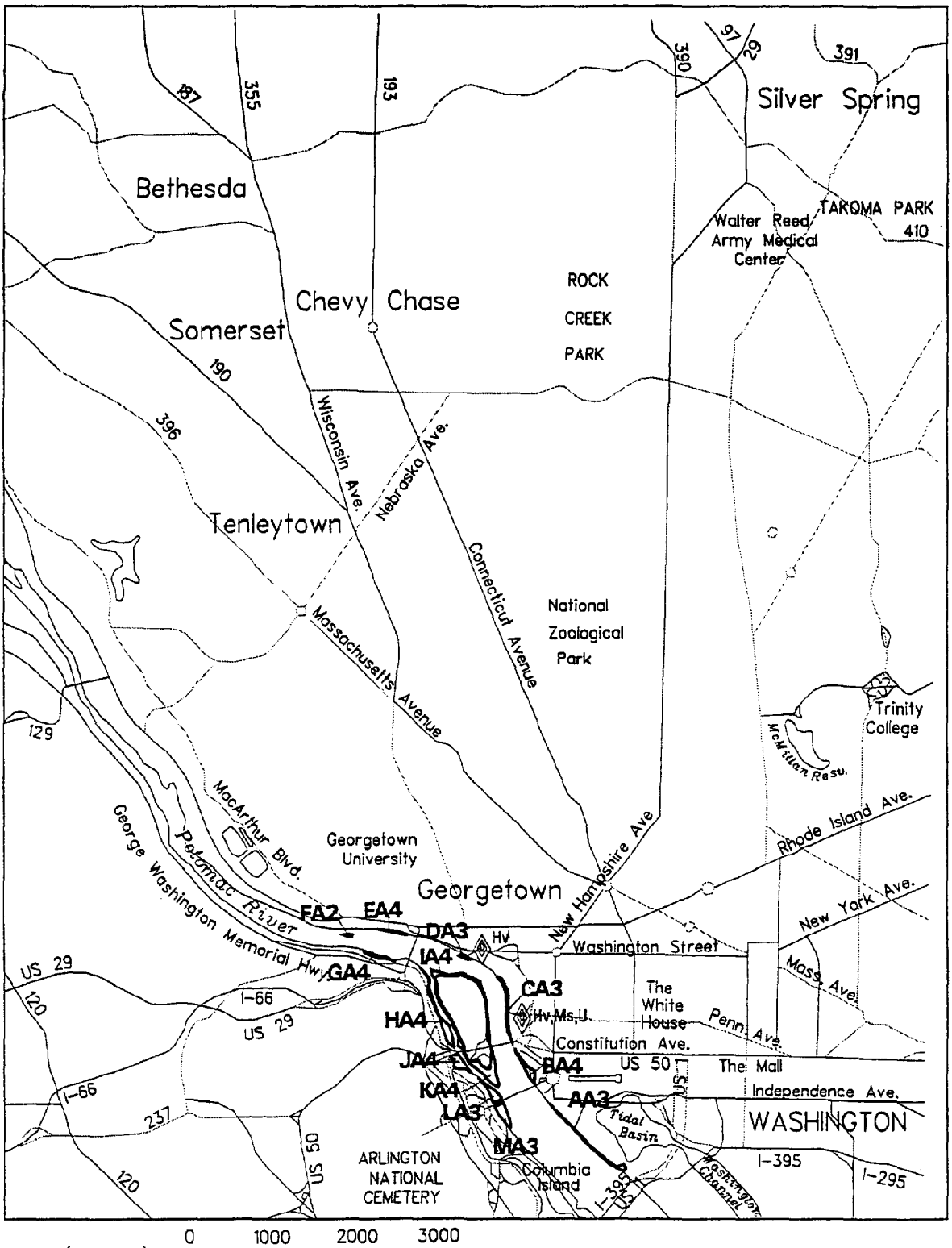

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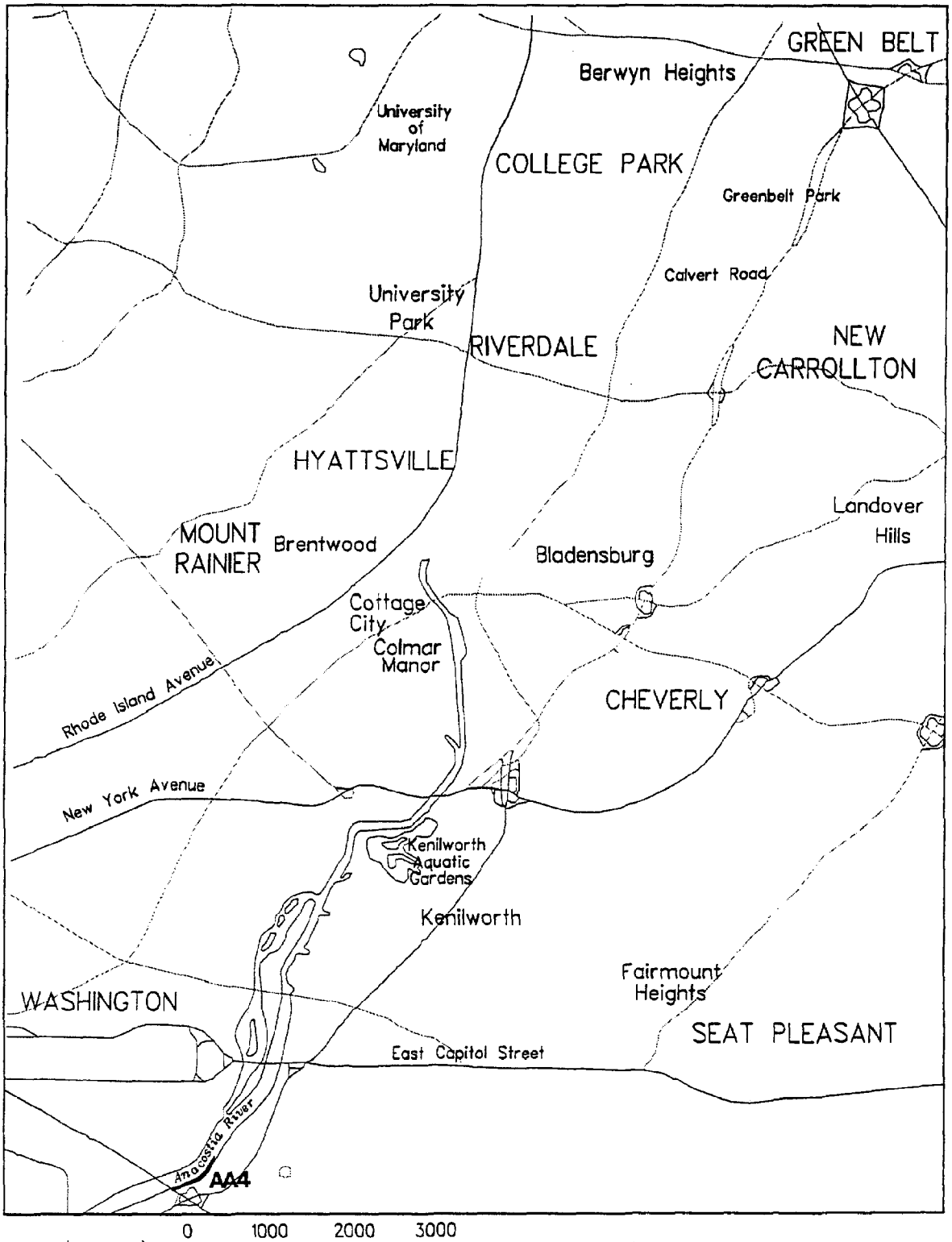

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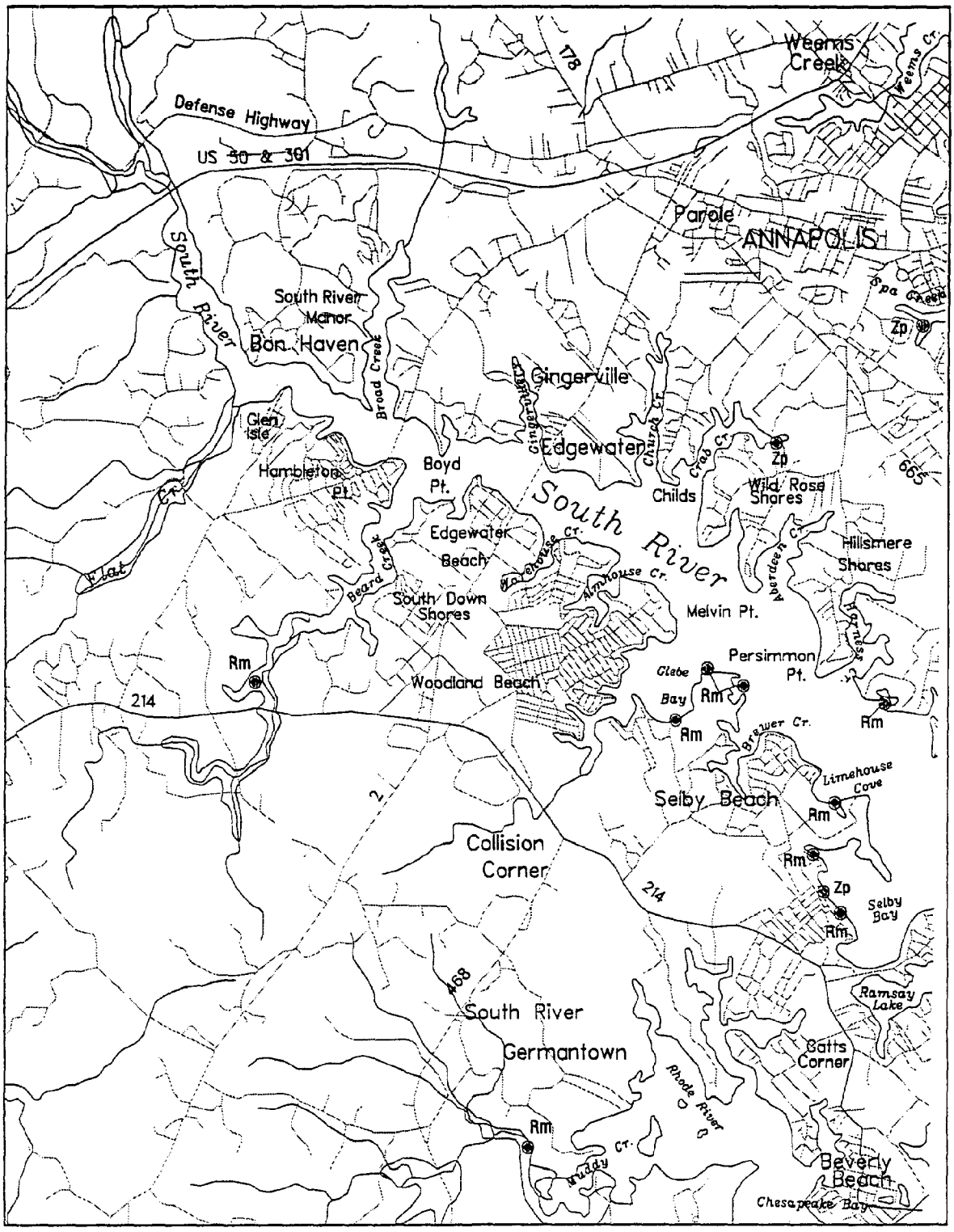
South River, Md.(030)



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Scale (meters):

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SUBMERGED AQUATIC VEGETATION 1993
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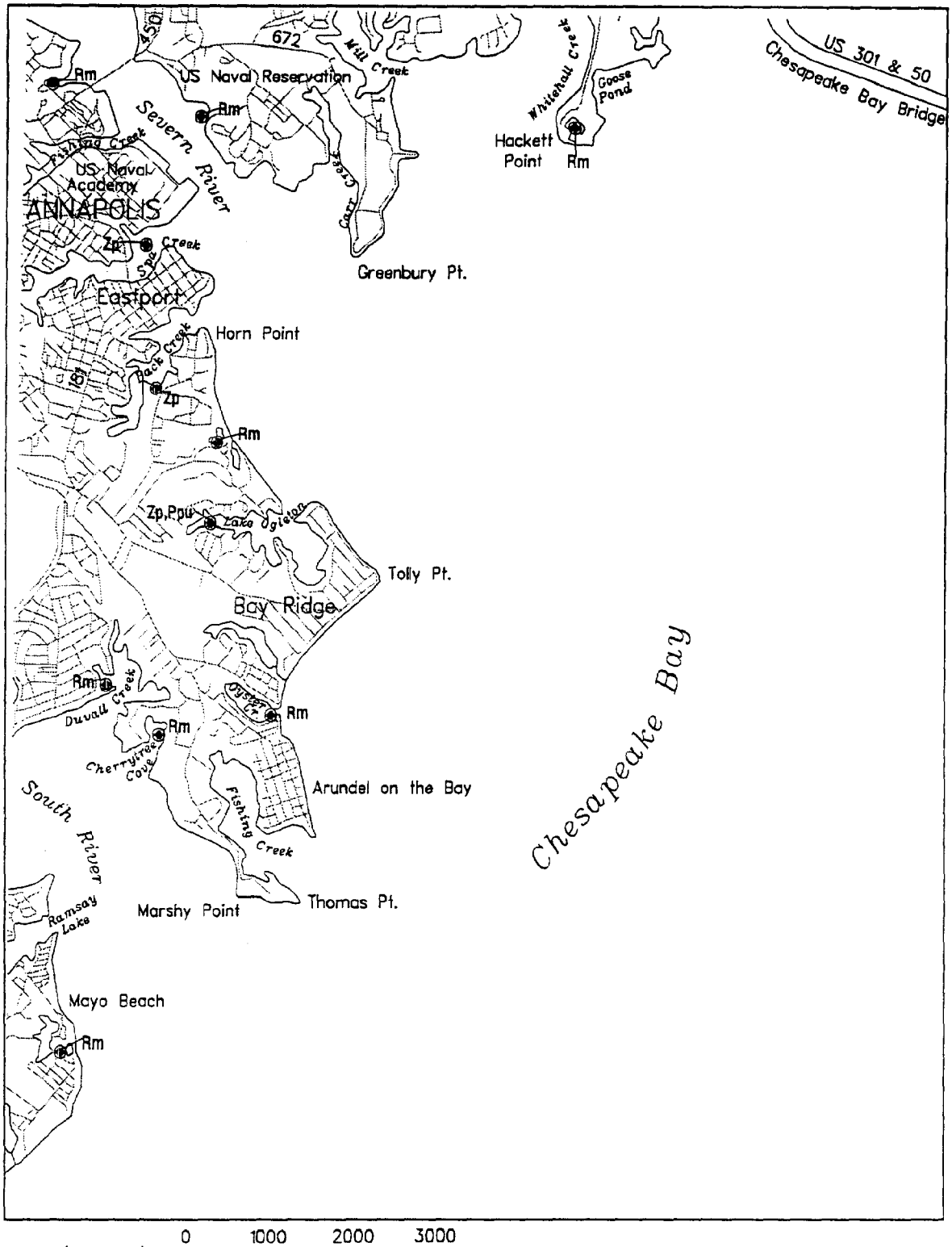

Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

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SUBMERGED AQUATIC VEGETATION 1993
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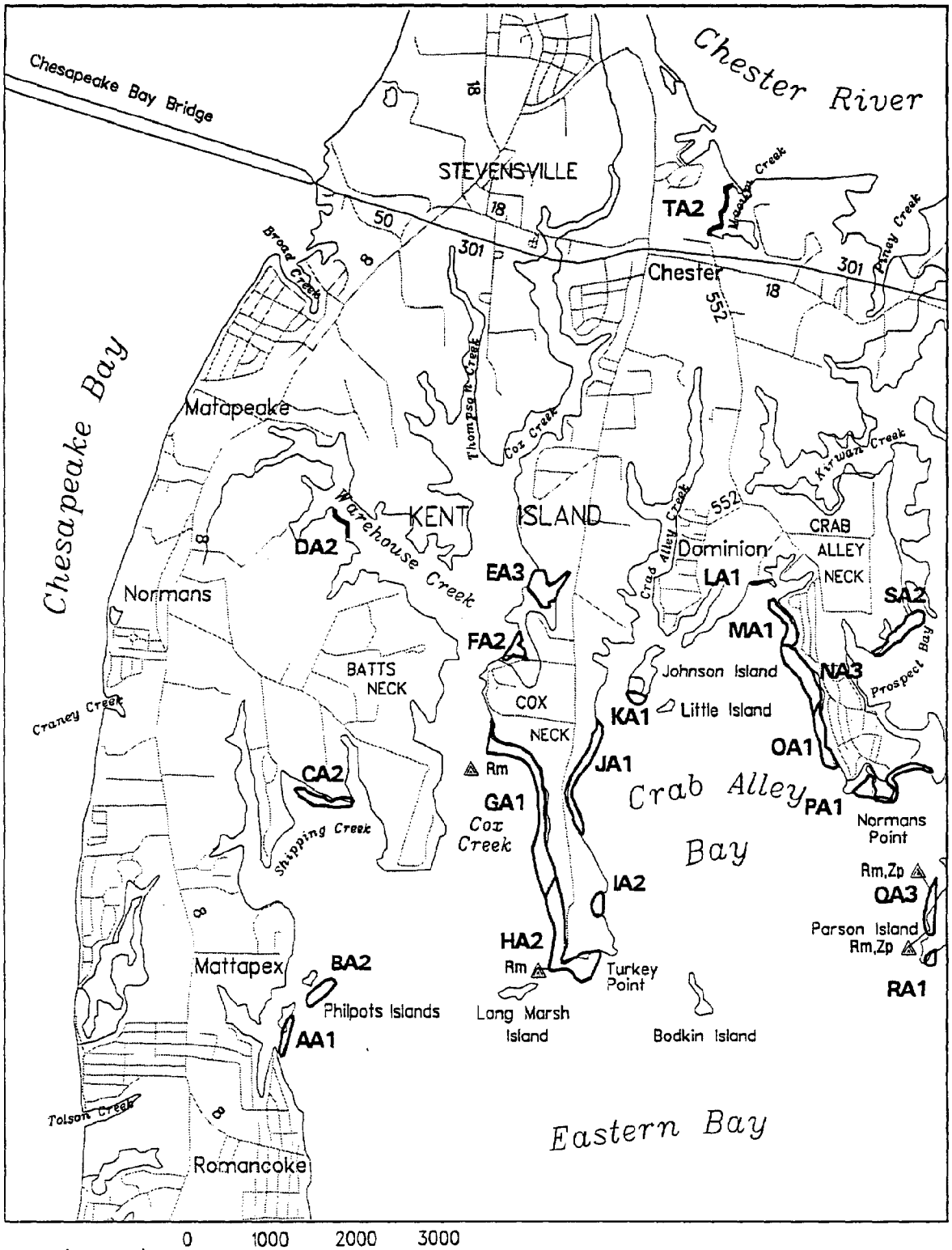

Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

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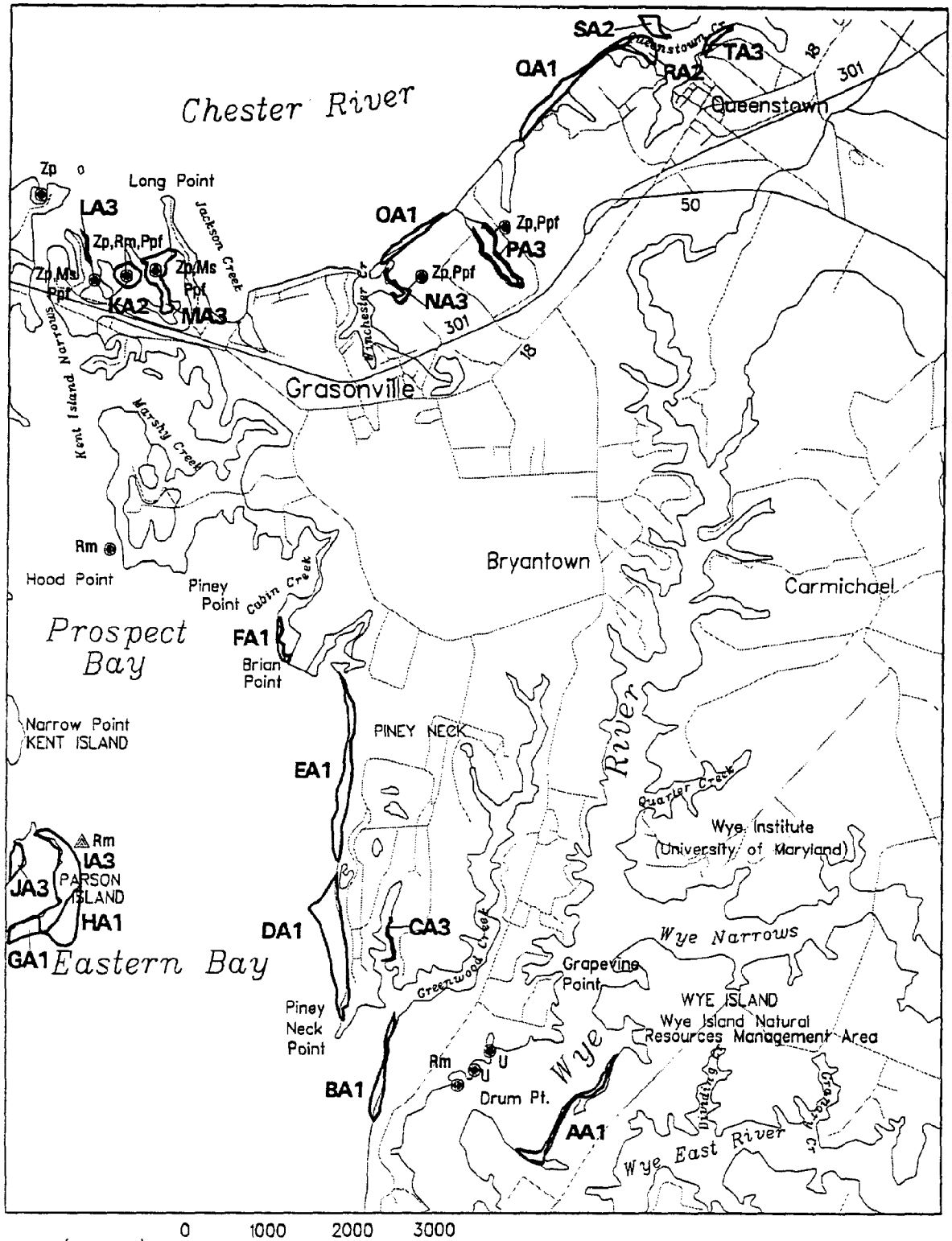
SUBMERGED AQUATIC VEGETATION 1993
Queenstown, Md.(033)



Scale (meters):

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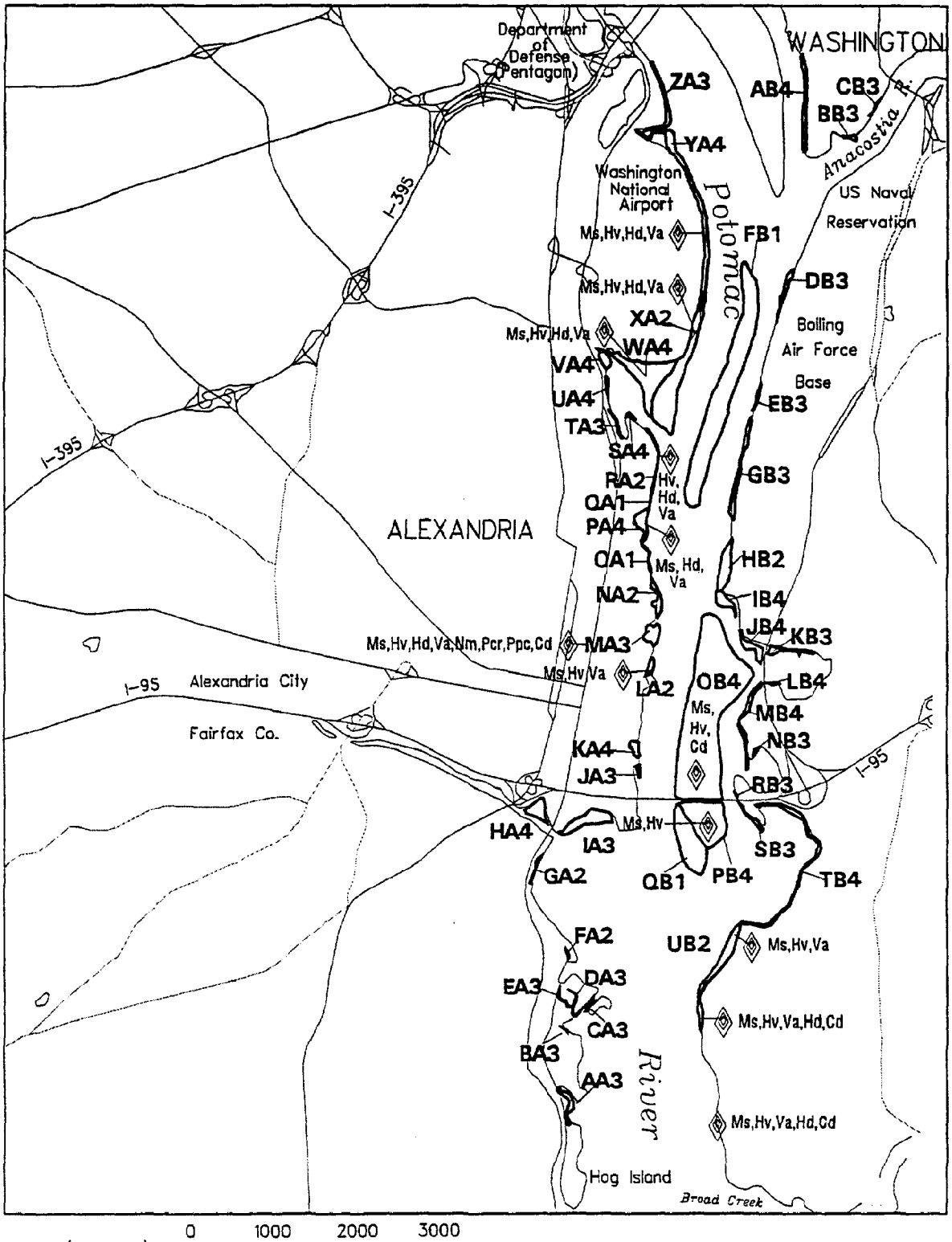

Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

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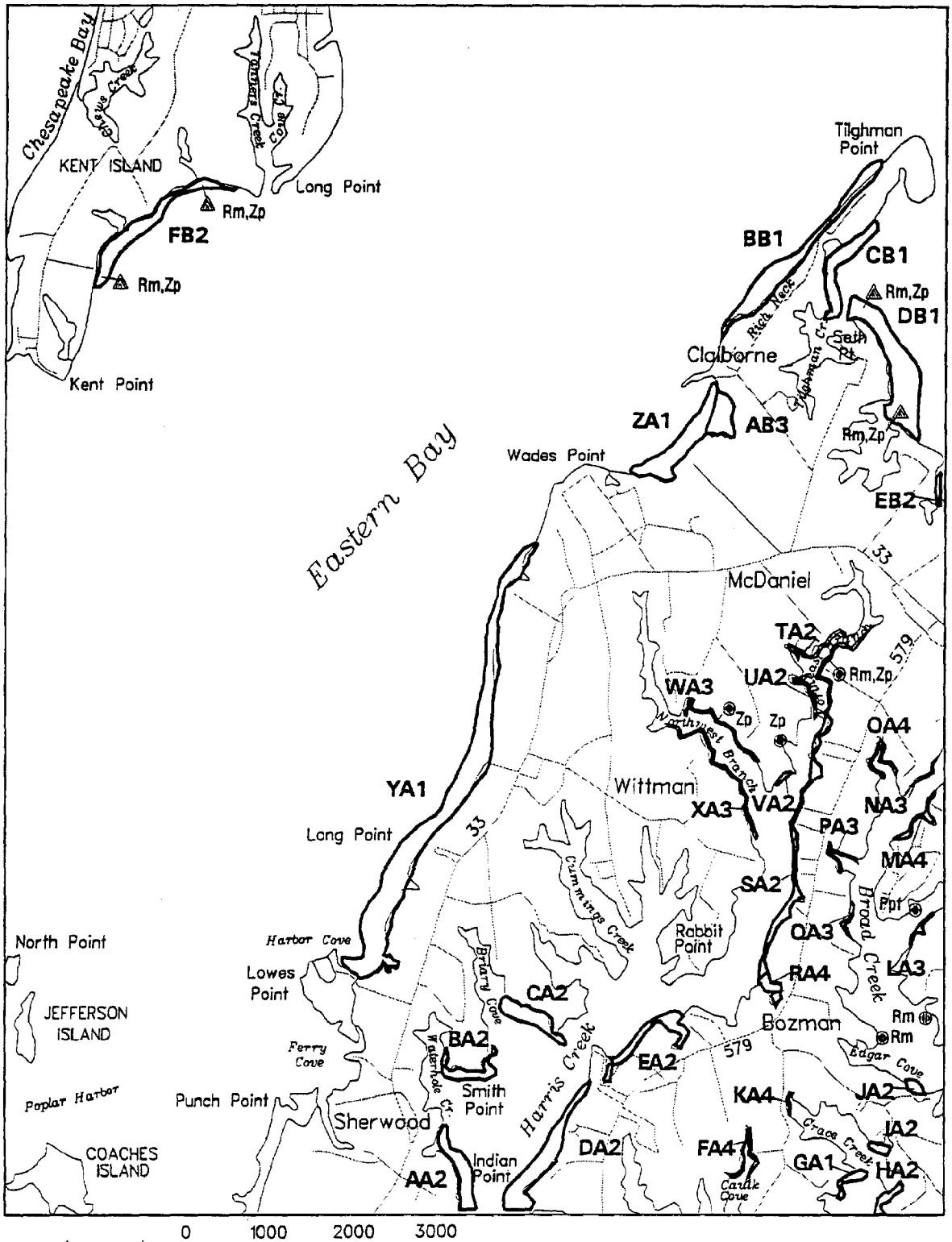
Claiborne, Md.(036)



Scale (meters):

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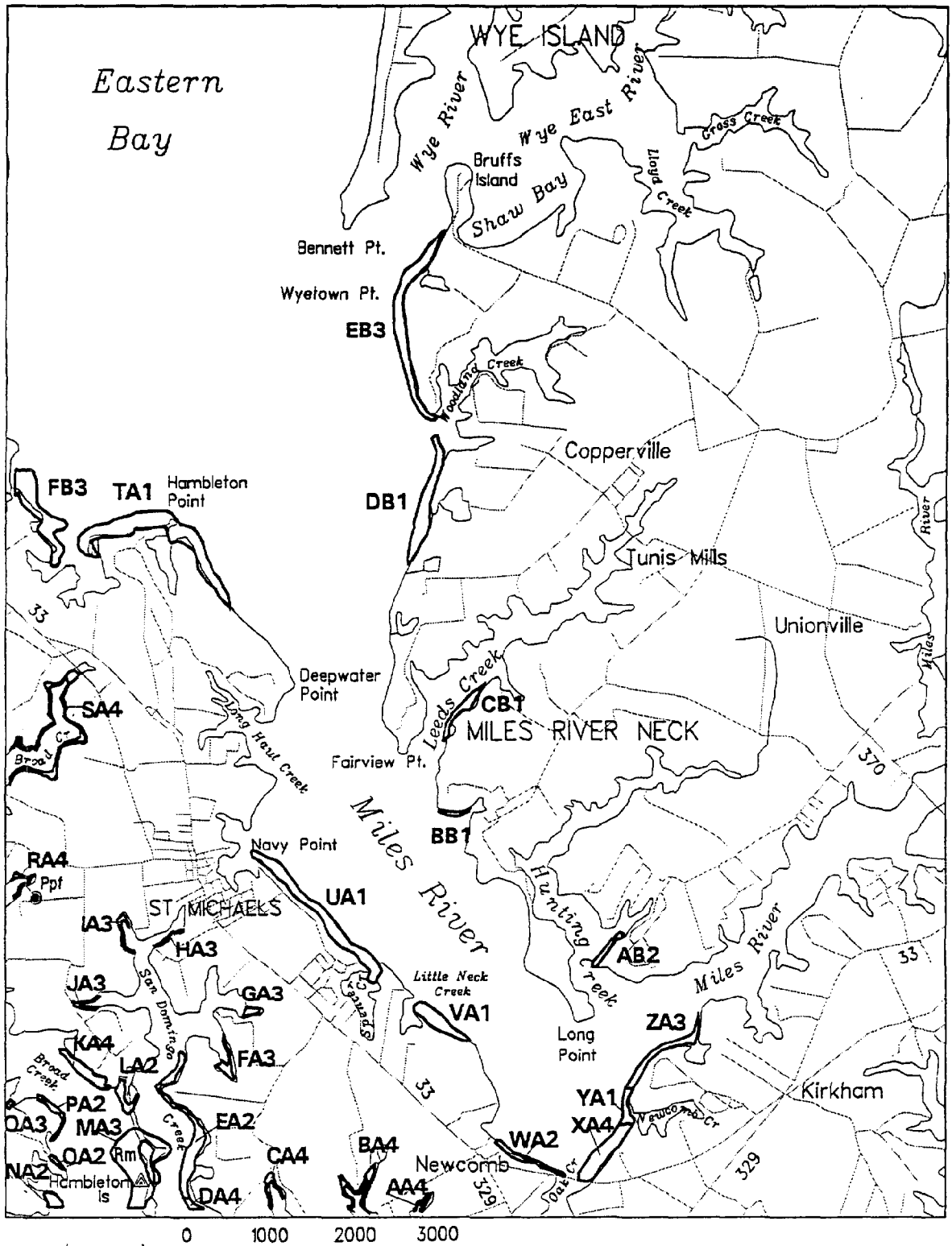

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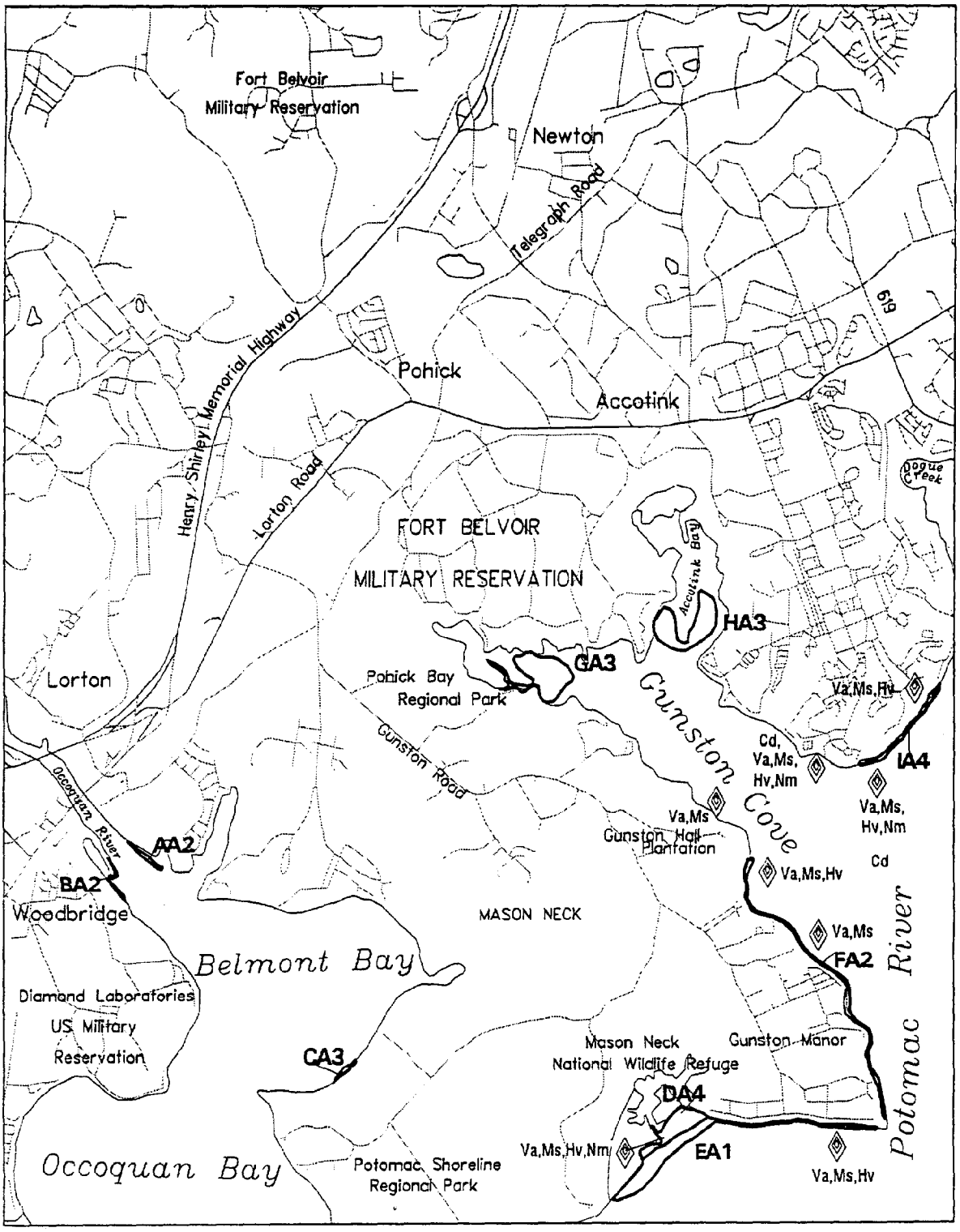
Fort Belvoir, Va.-Md.(039)



Scale (meters):

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U.S. Geological Survey

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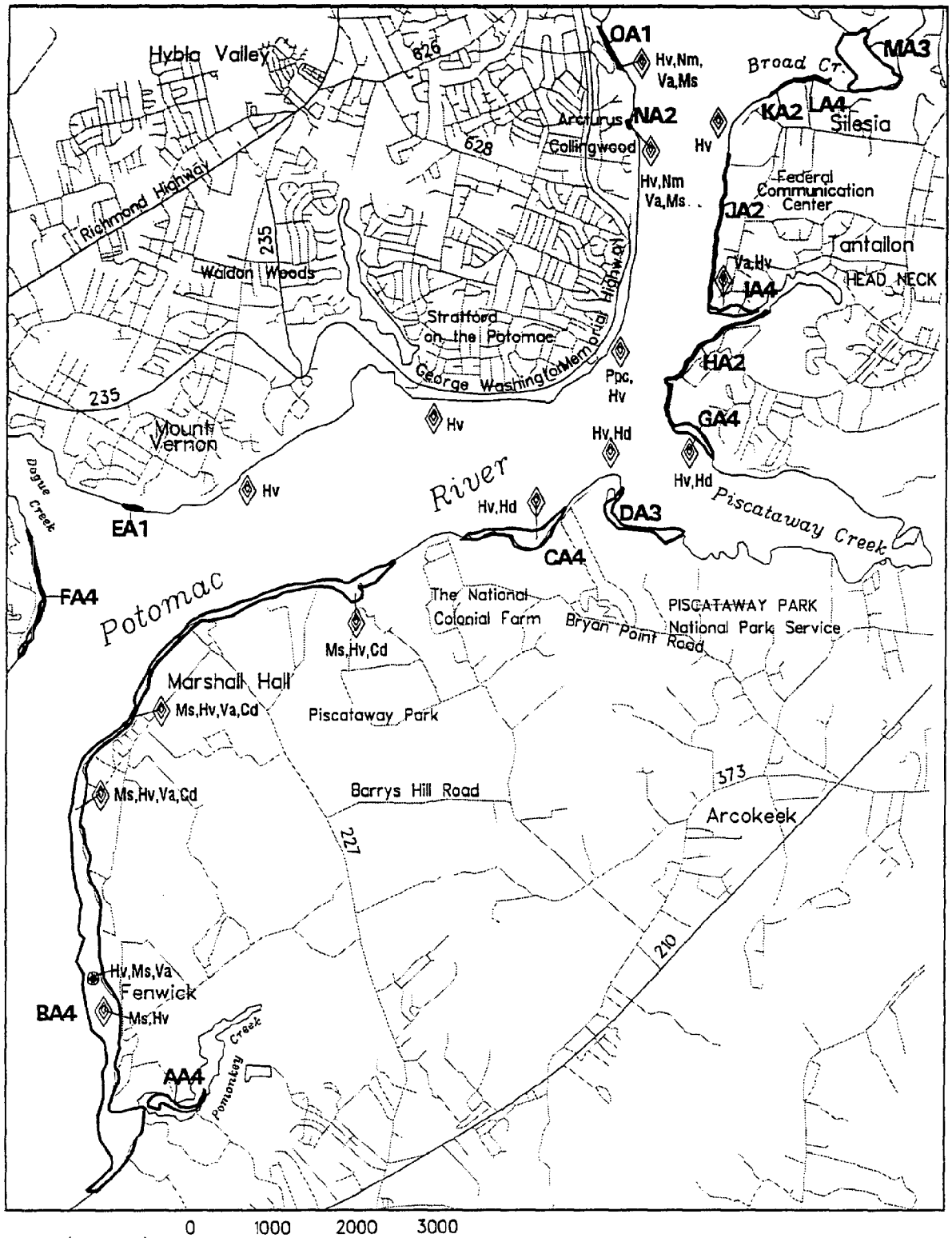
SUBMERGED AQUATIC VEGETATION 1993
Mt. Vernon, Md.-Va.(040)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 9-12-93

Produced by:
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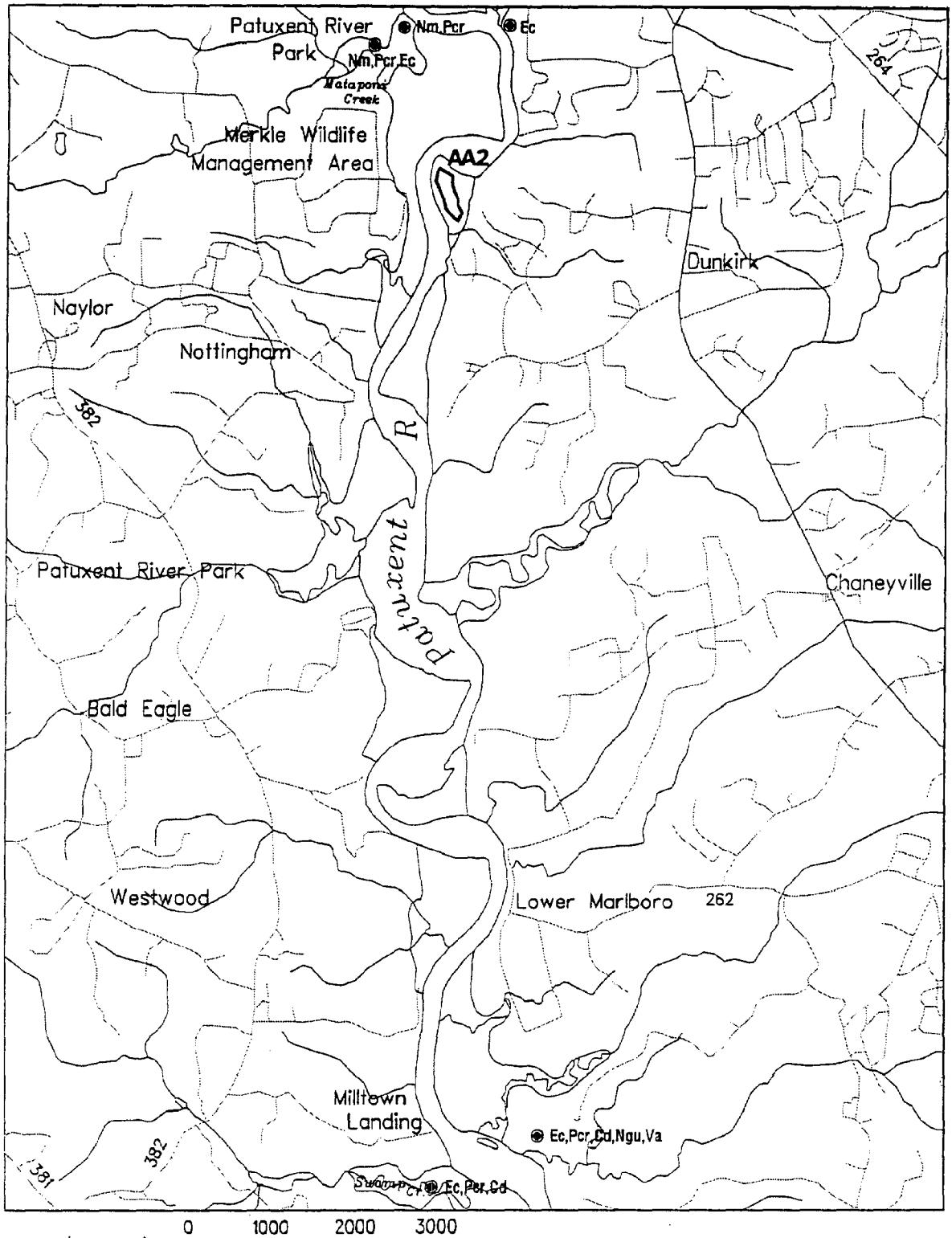
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Lower Marlboro, Md.(041)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-16-93

Produced by:
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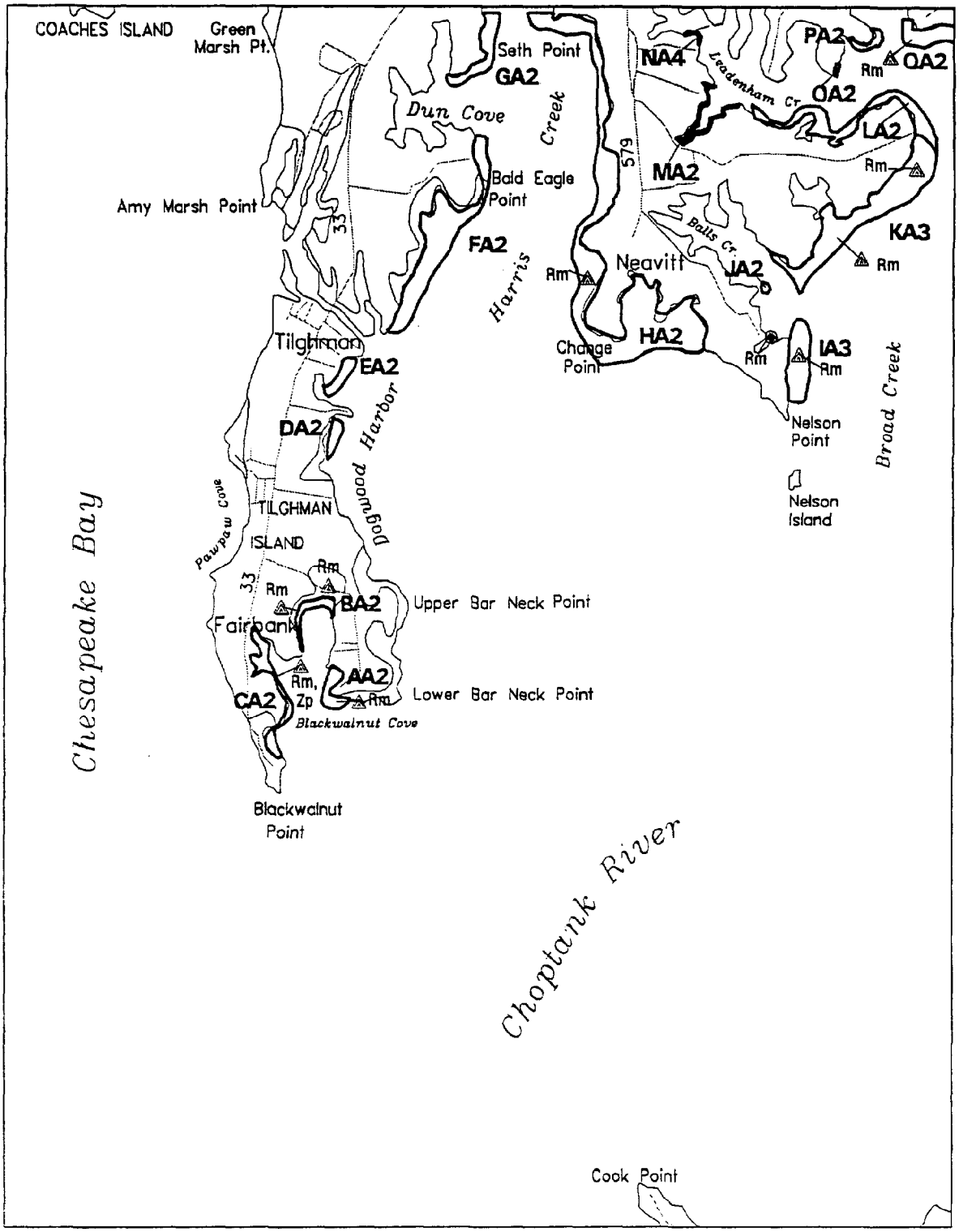
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Tilghman, Md.(043)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-16-93

Produced by:
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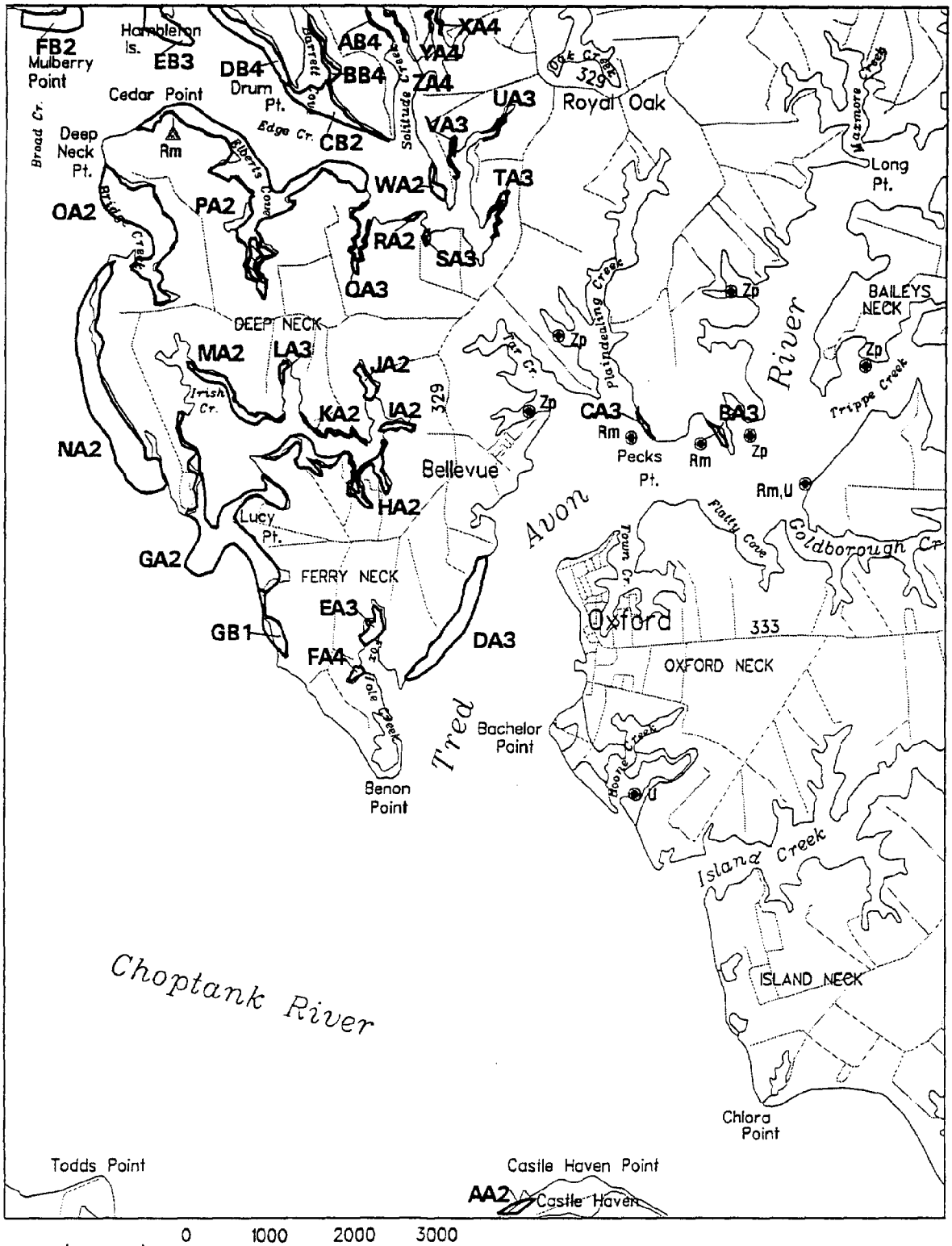
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Oxford, Md.(044)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-16-93

Produced by:
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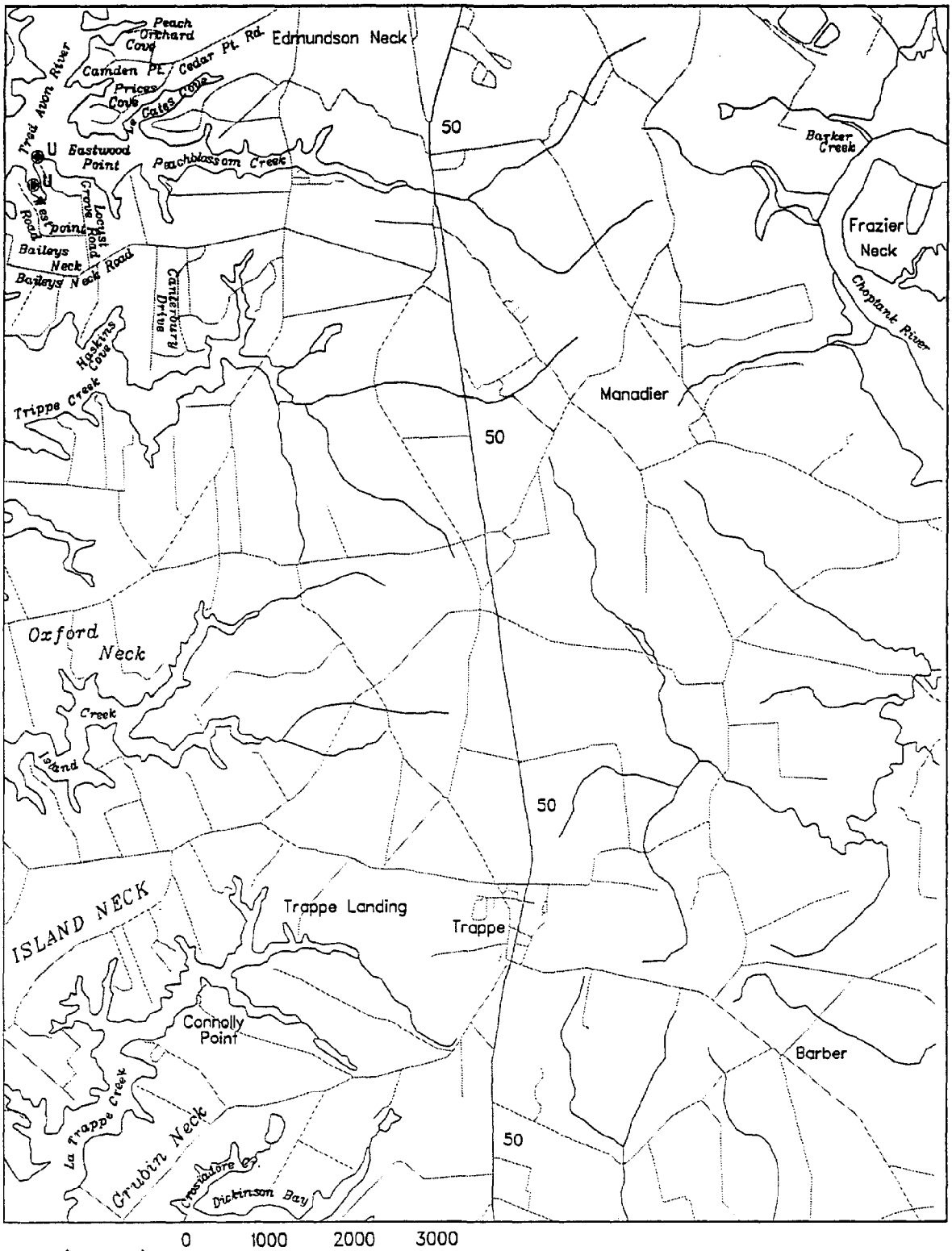
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Trappe, Md.(045)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-18-93

Produced by:
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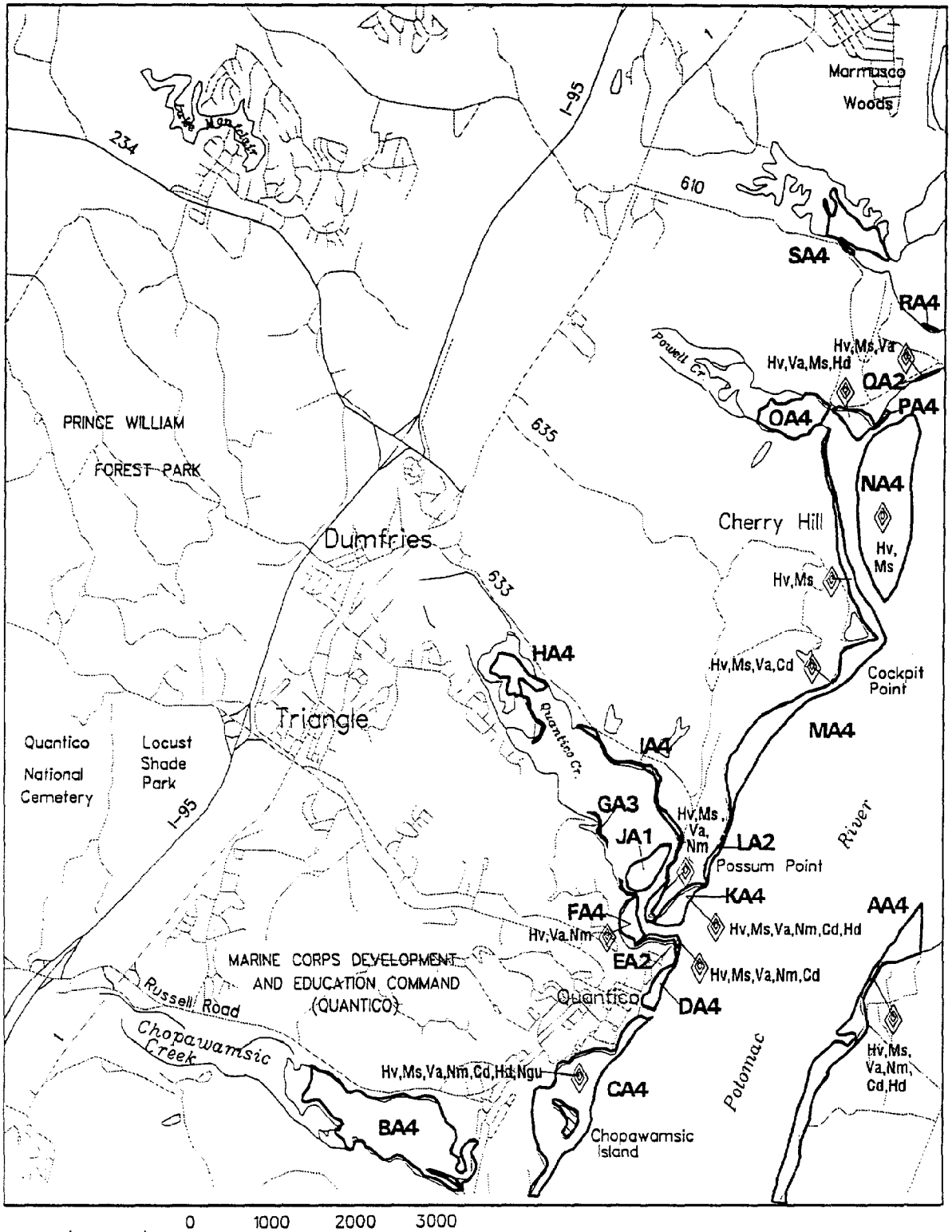
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Quantico, Va.-Md.(047)



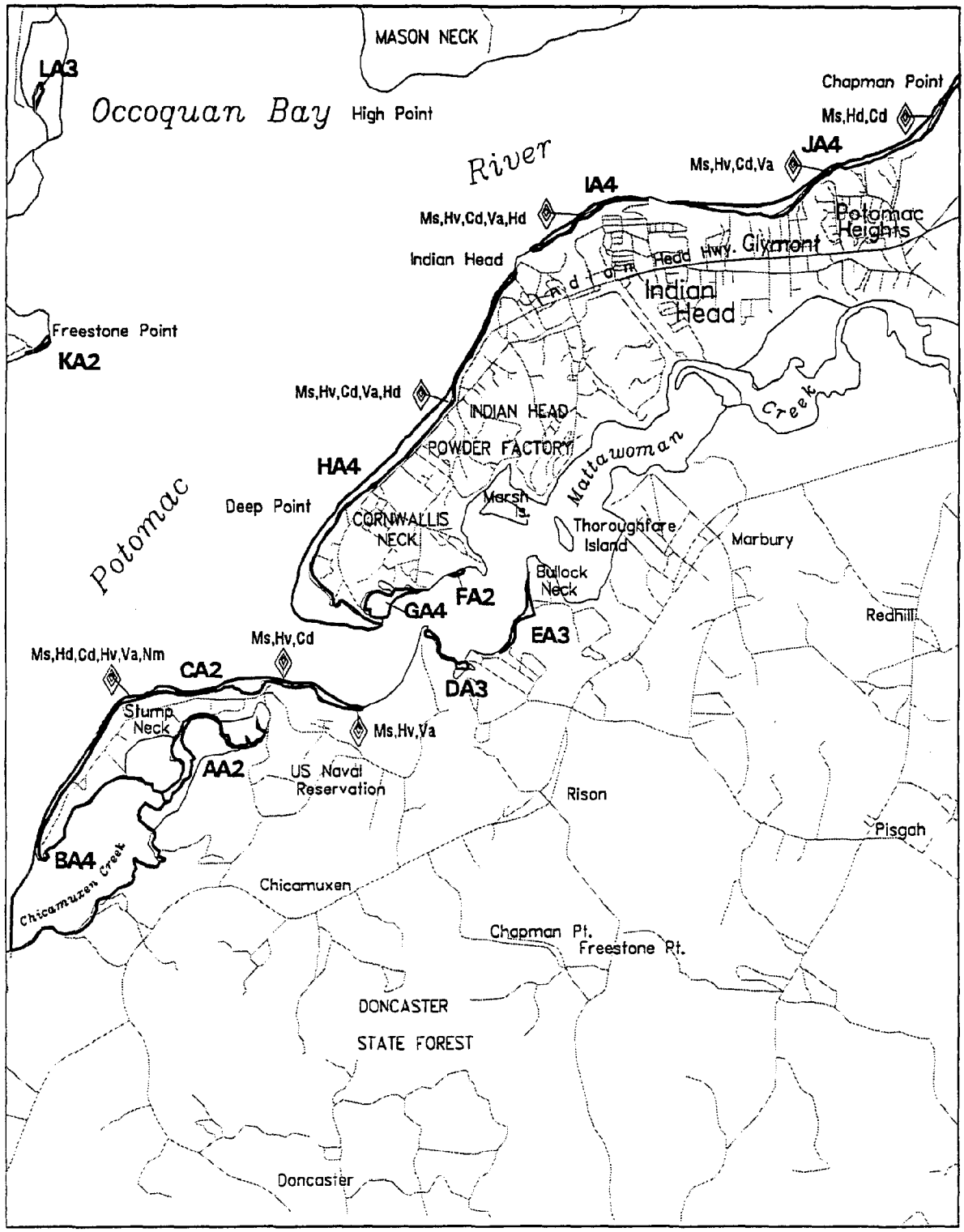
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 9-12-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Indian Head, Va.-Md.(048)



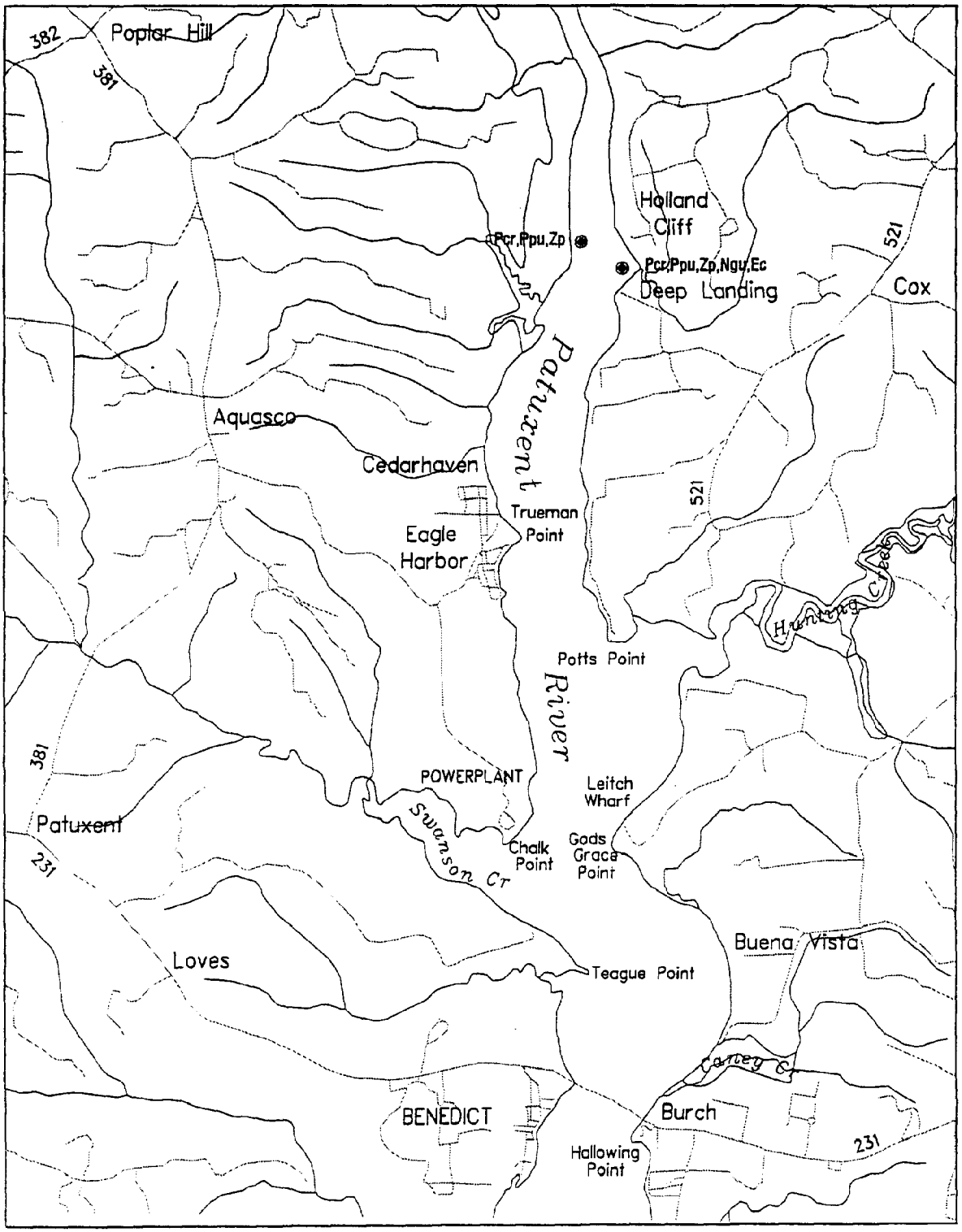
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 9-12-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Benedict, Md.(049)



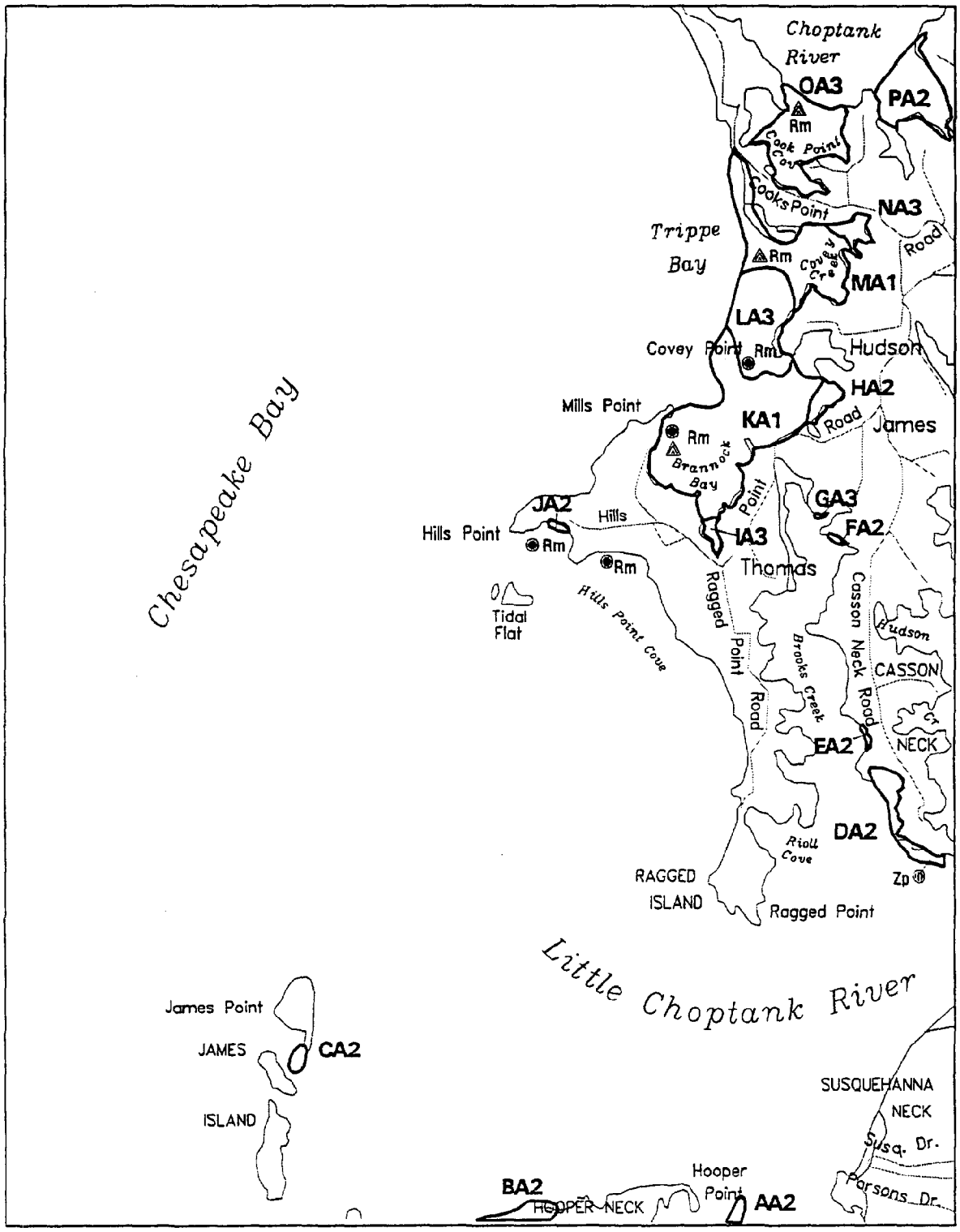
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-16-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Hudson, Md.(051)



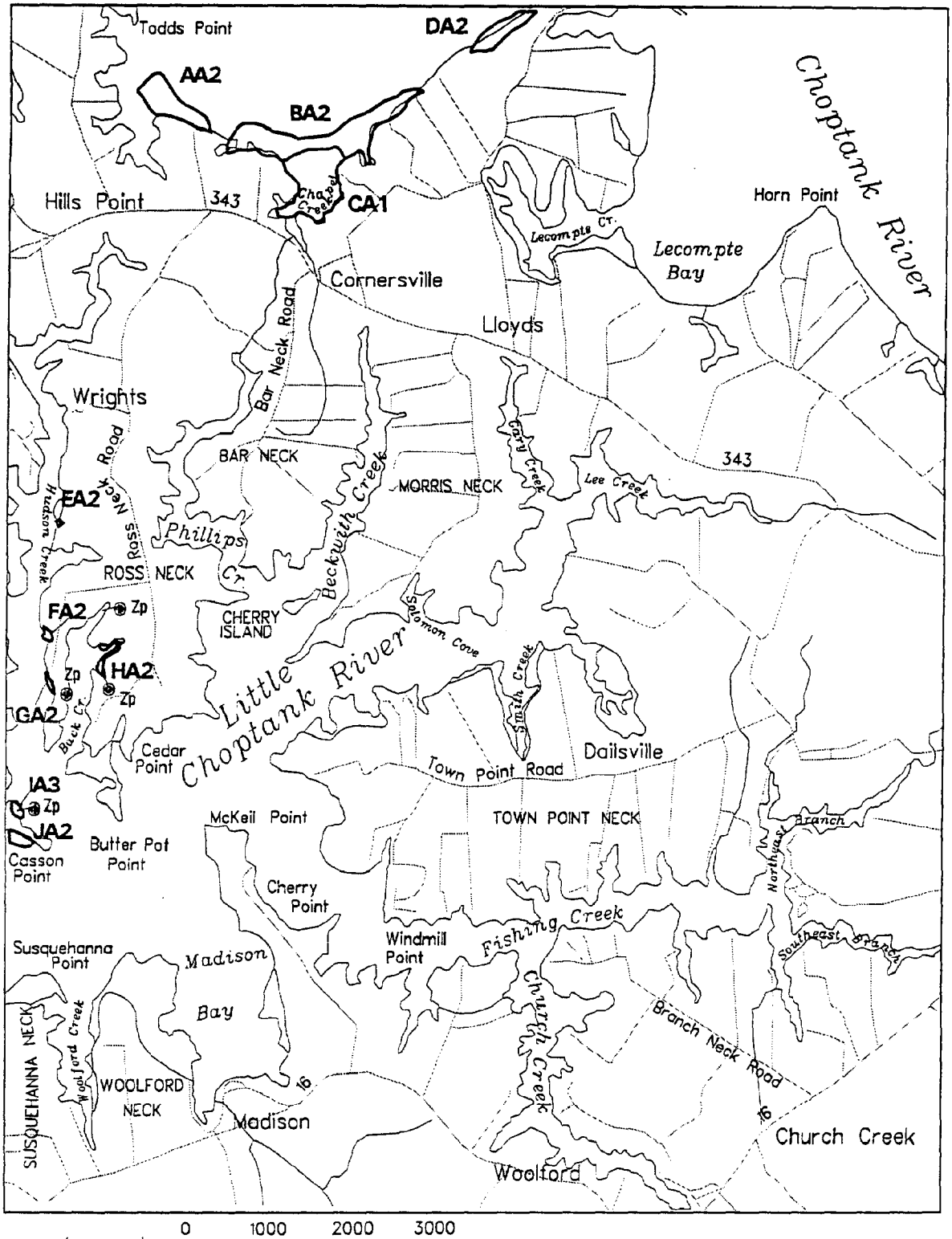
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-24-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Church Creek, Md.(052)



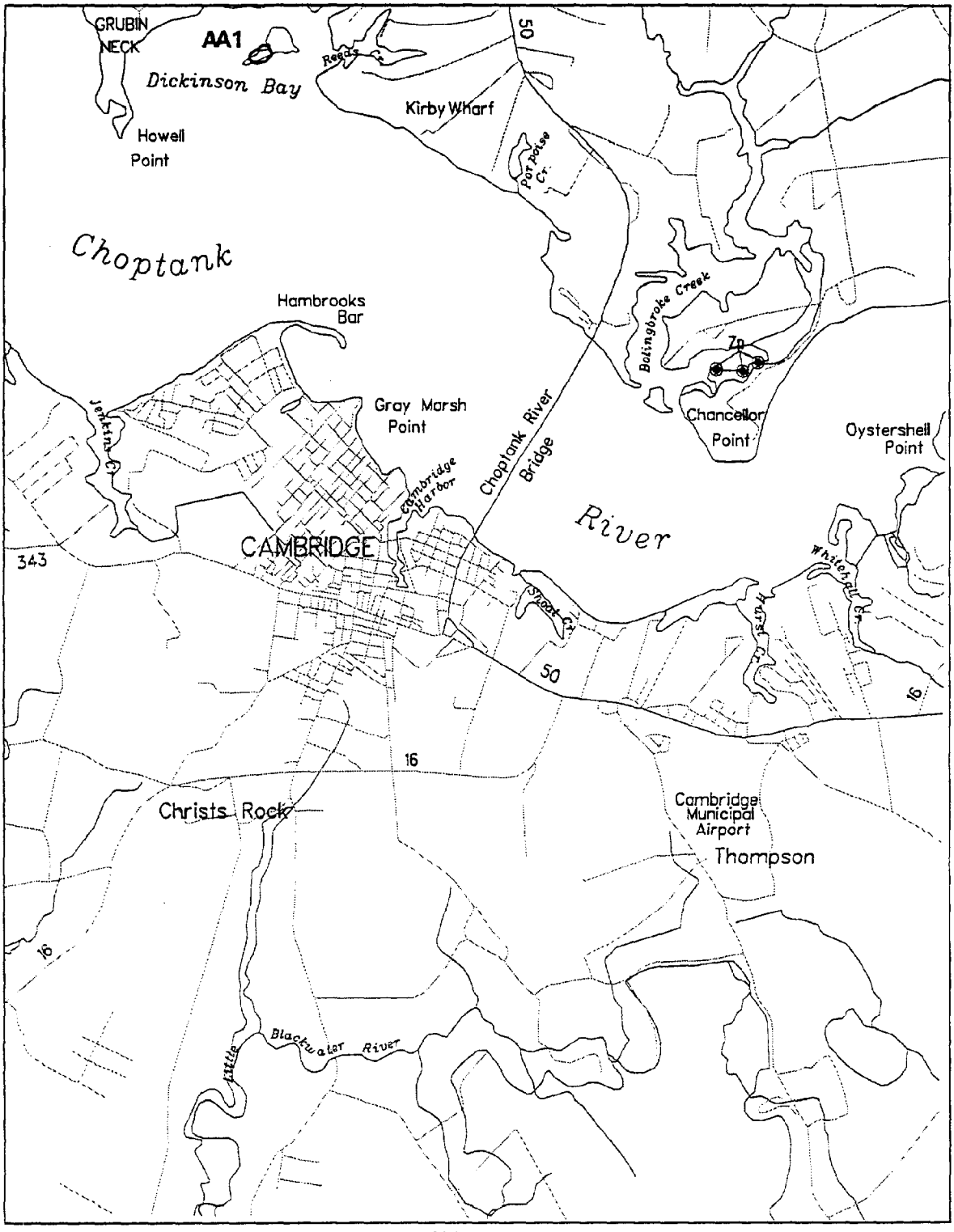
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-18-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Cambridge, Md.(053)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-18-93

Procuced by:
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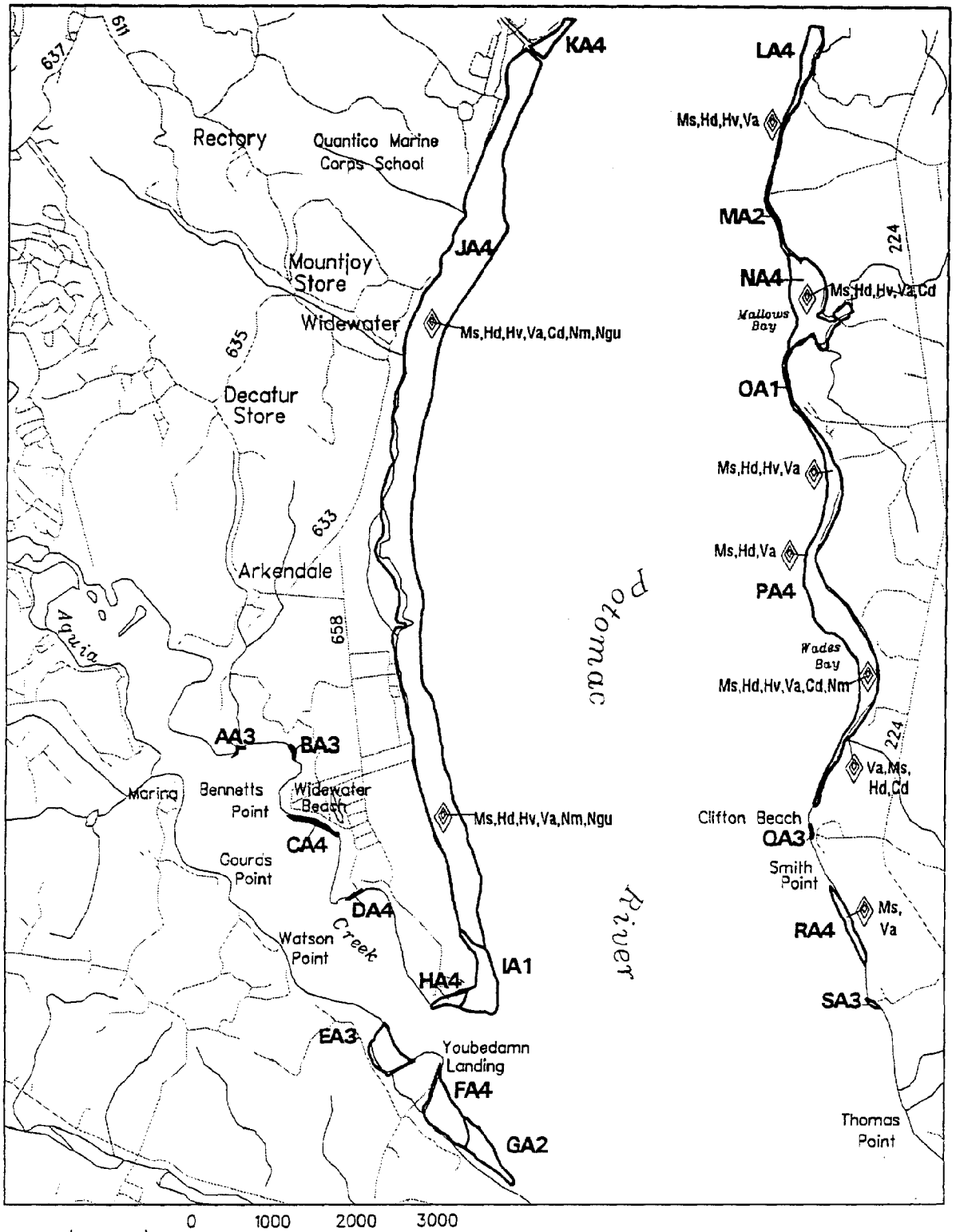
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Widewater, Va.- Md.(055)



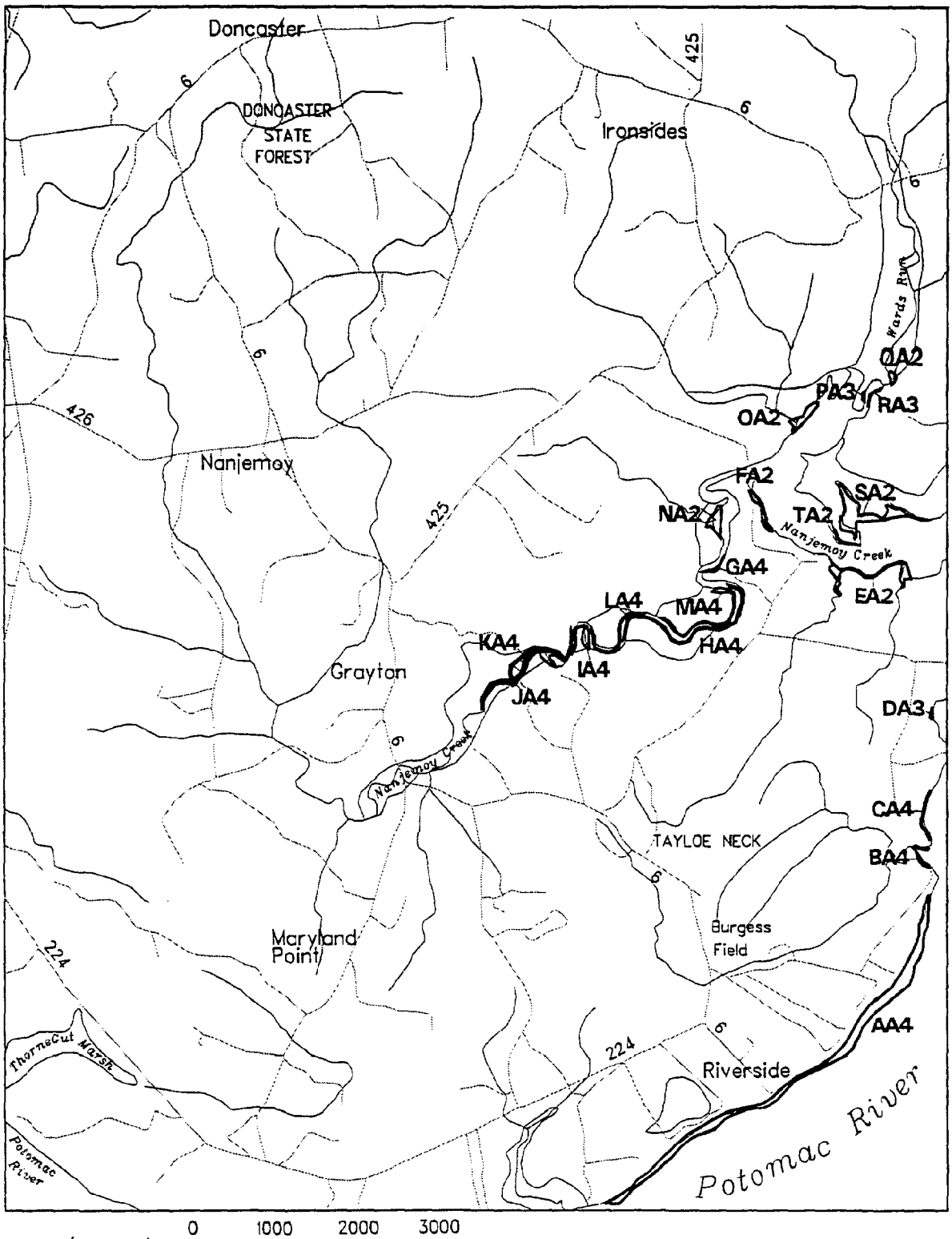
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 9-12-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Nanjemoy, Md. (056)



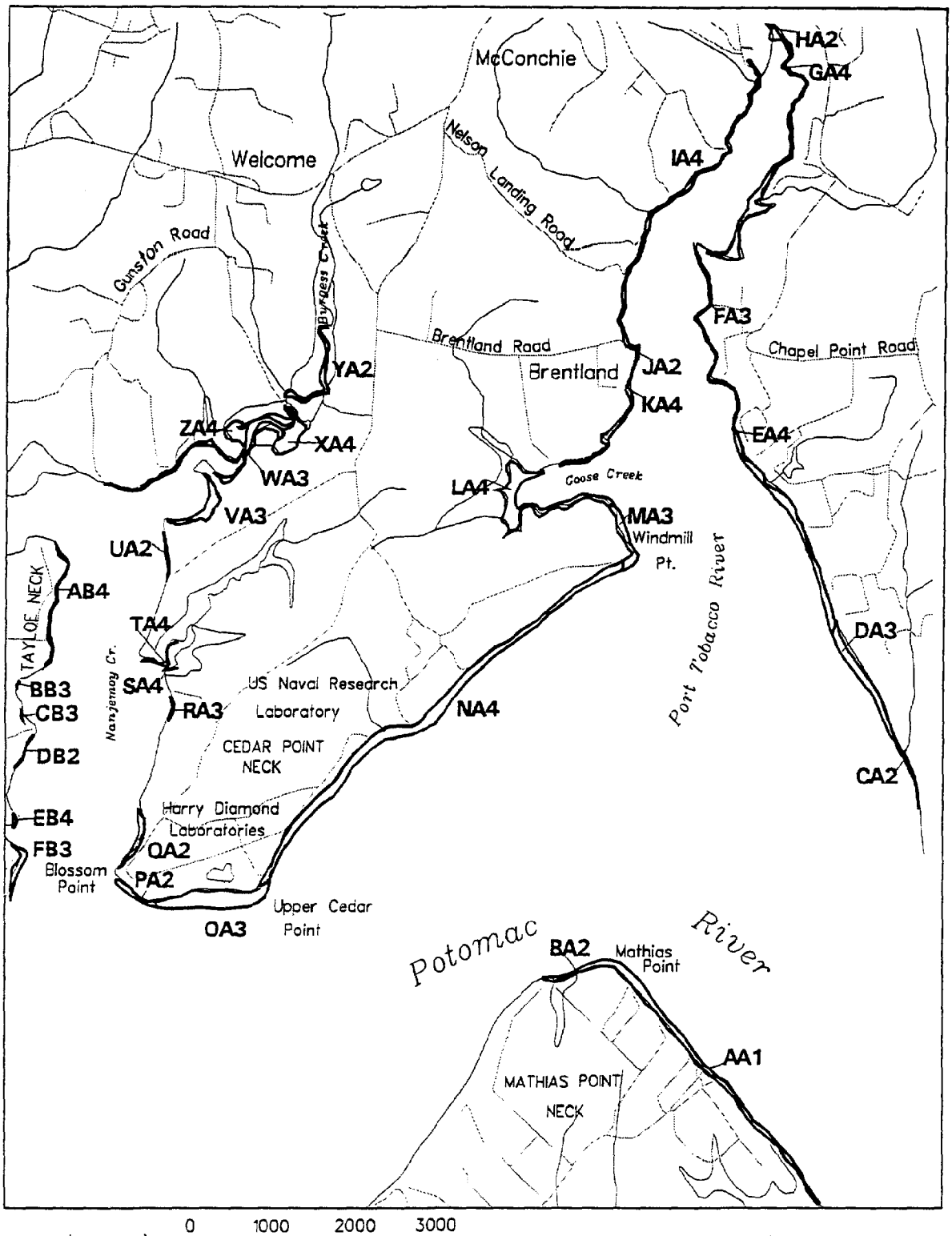
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 9-12-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Mathias Point, Md.- Va.(057)



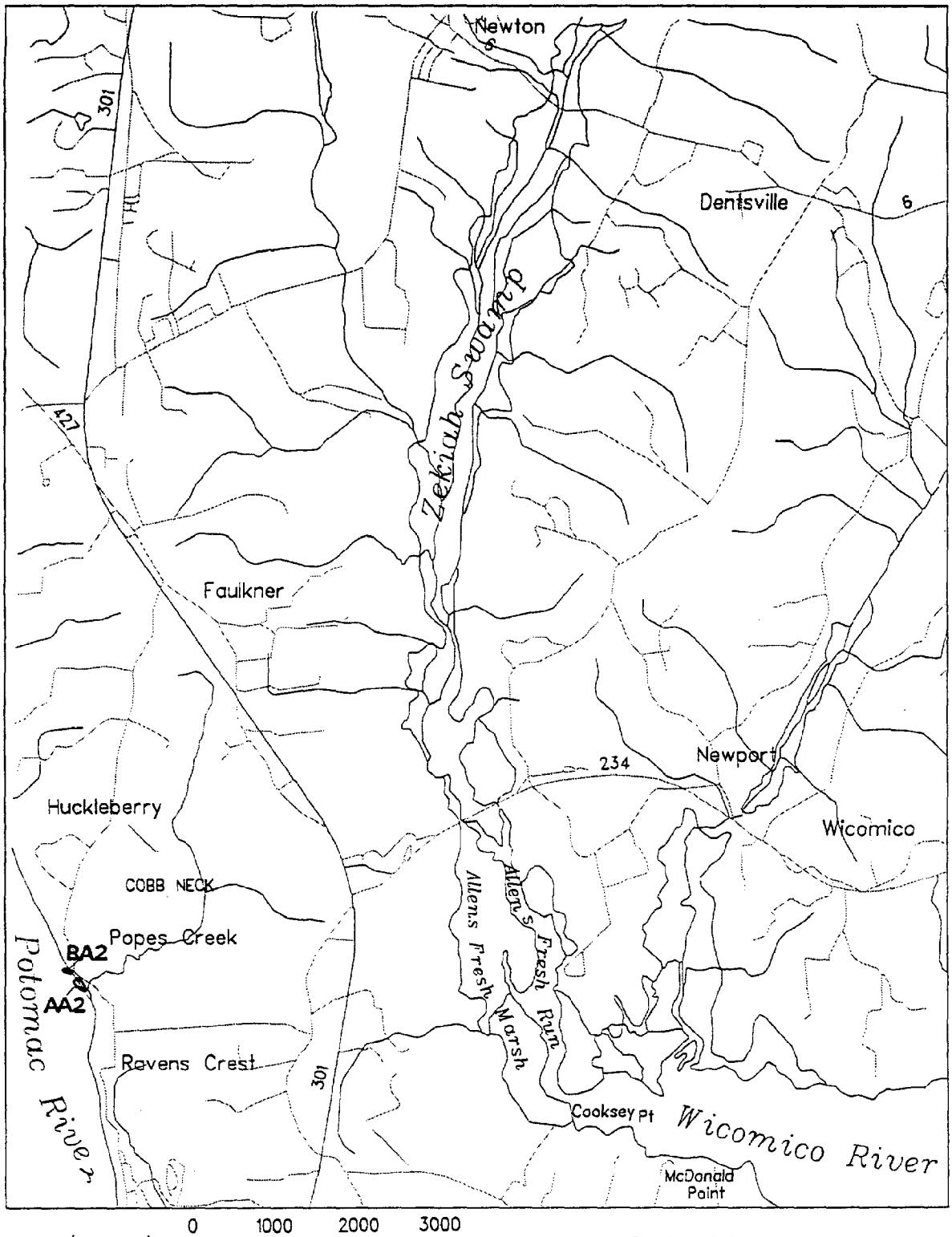
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 9-12-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Popes Creek, Md.(058)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-16-93

Produced by:
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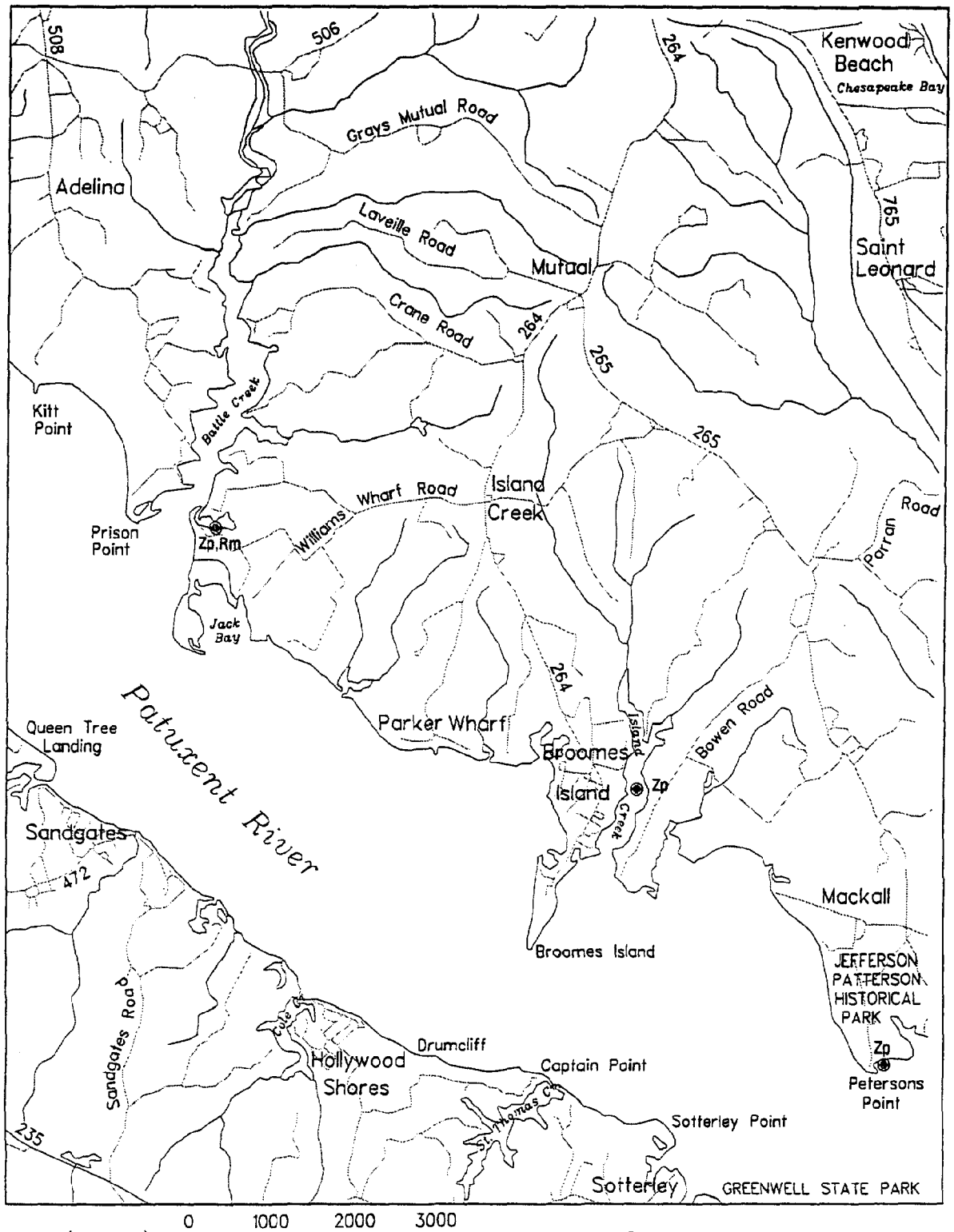
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Broomes Island, Md.(060)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-16-93

Produced by:
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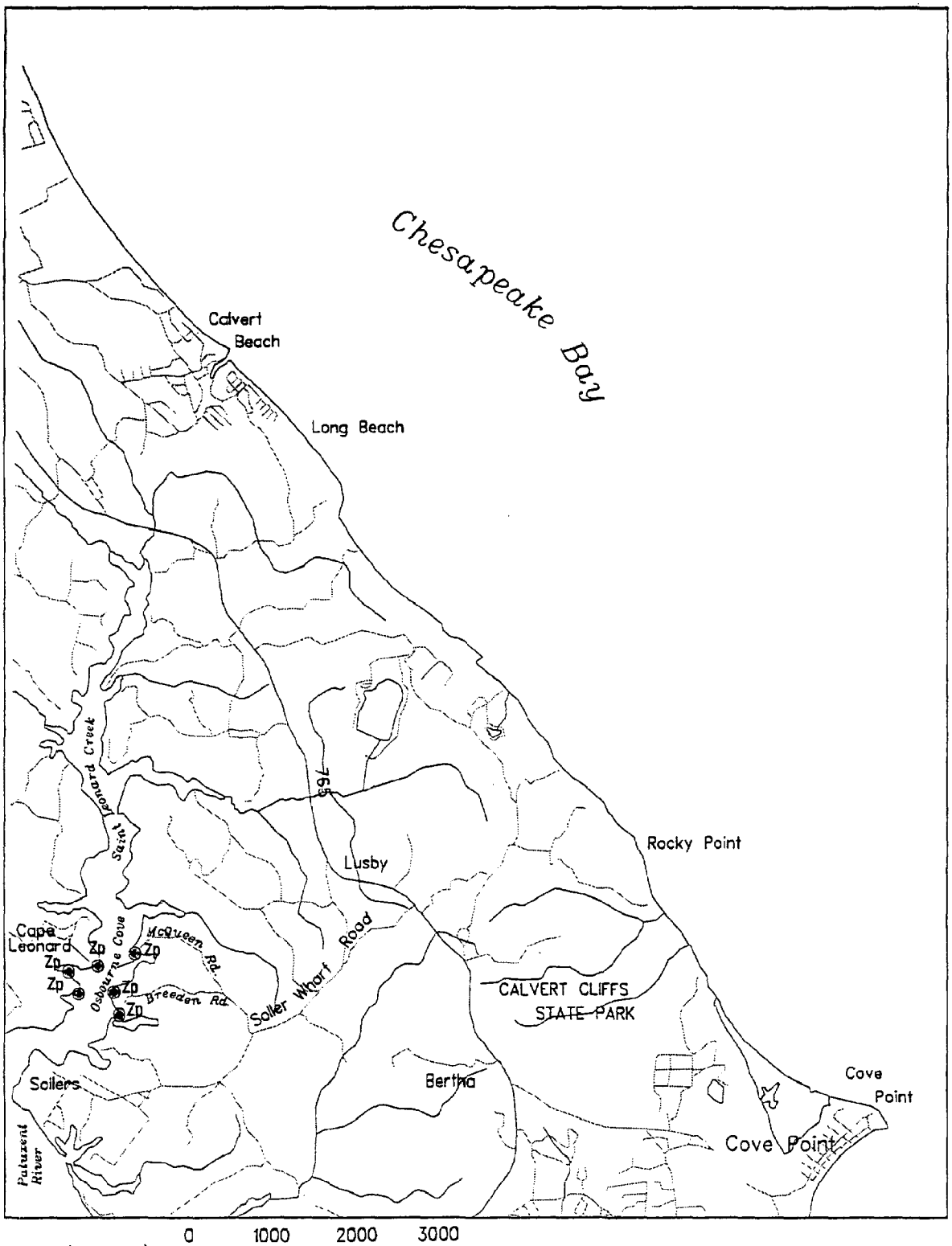
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Cove Point, Md.(061)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-16-93

Produced by:
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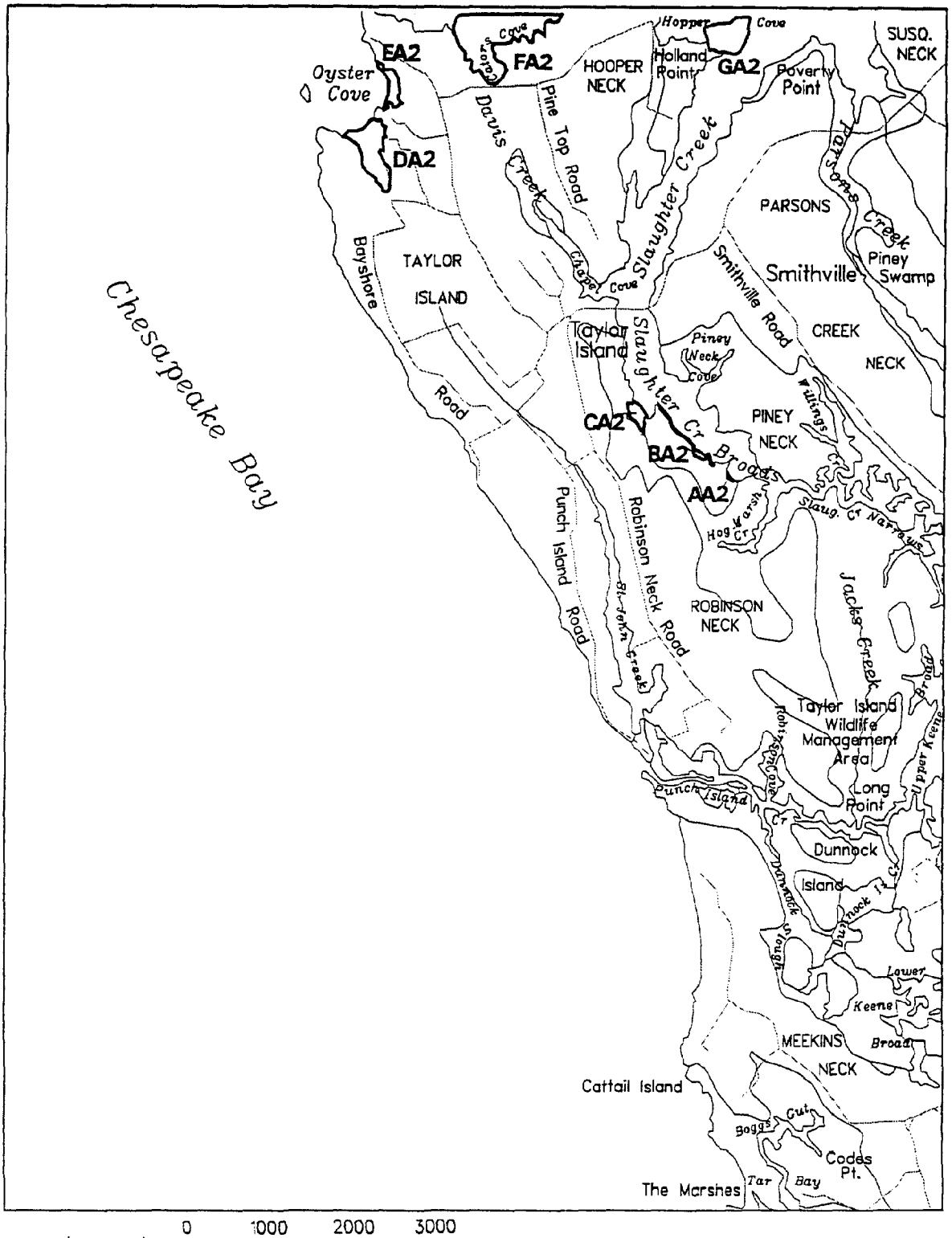
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Taylors Island, Md.(062)



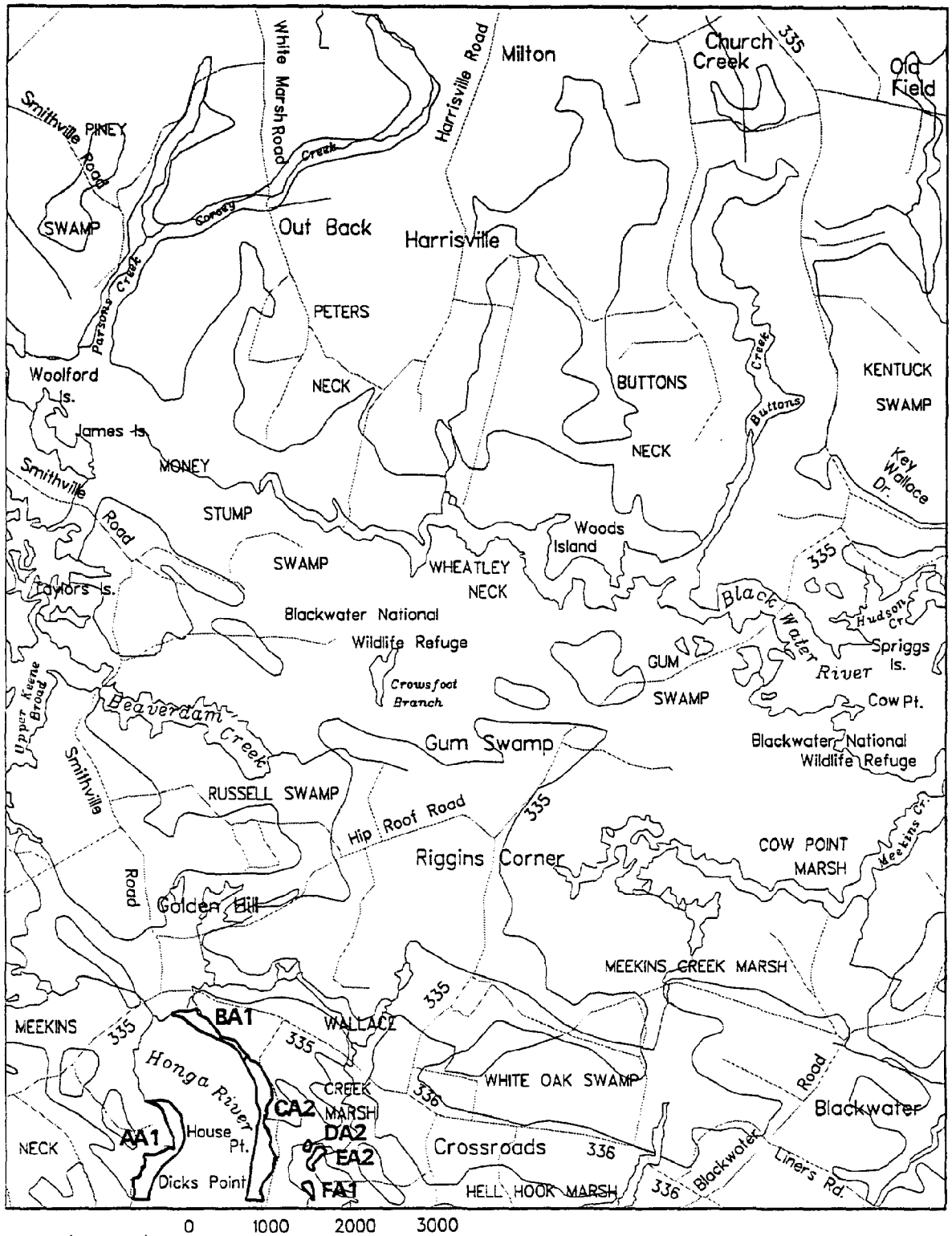
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-24-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Golden Hill, Md.(063)



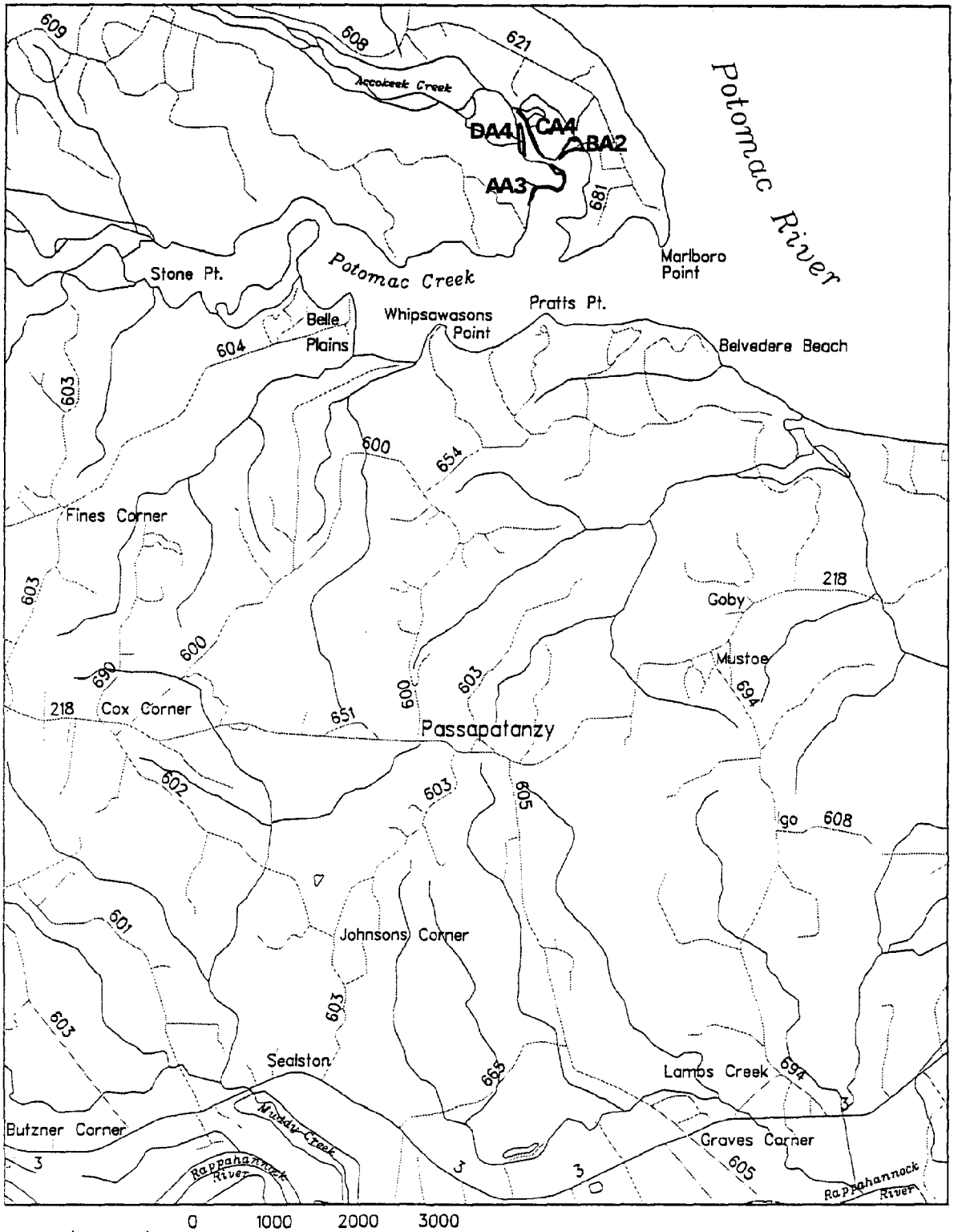
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-24-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Passapatanzy, Md.-Va.(064)



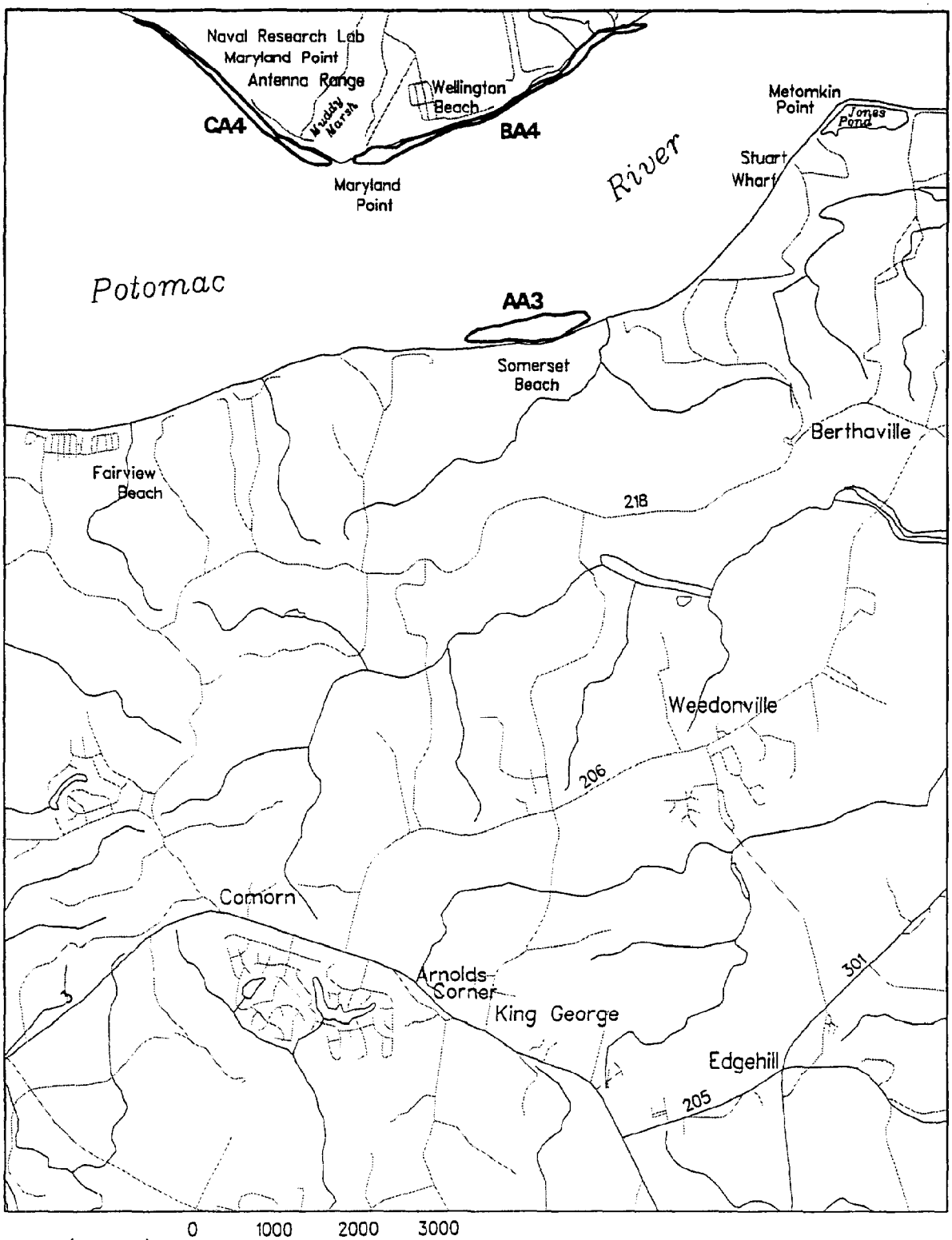
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 9-12-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
King George, Va.-Md.(065)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 9-12-93

Produced by:
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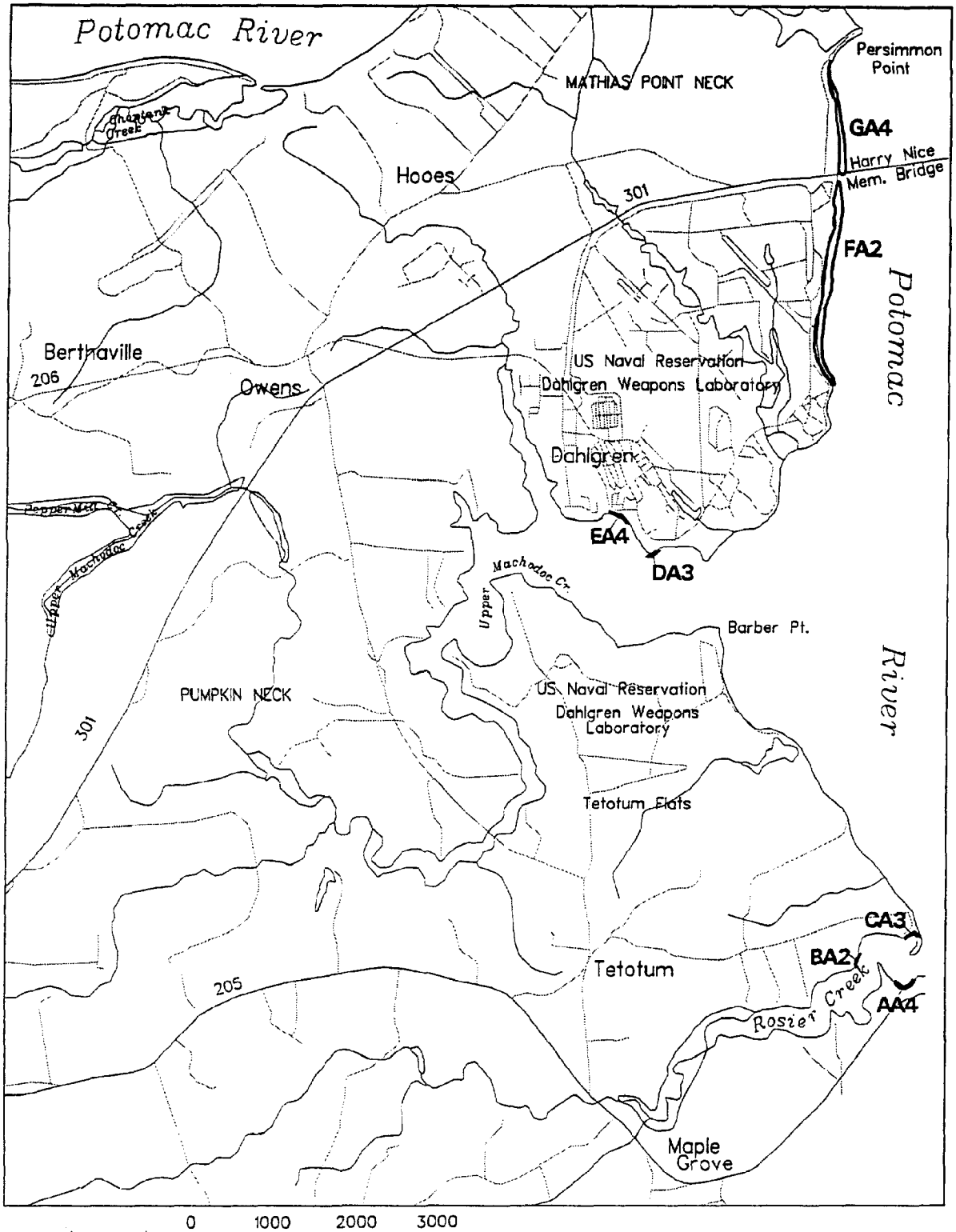
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Dahlgren, Va.-Md.(066)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-16-93

Produced by:
Virginia Institute of Marine Science
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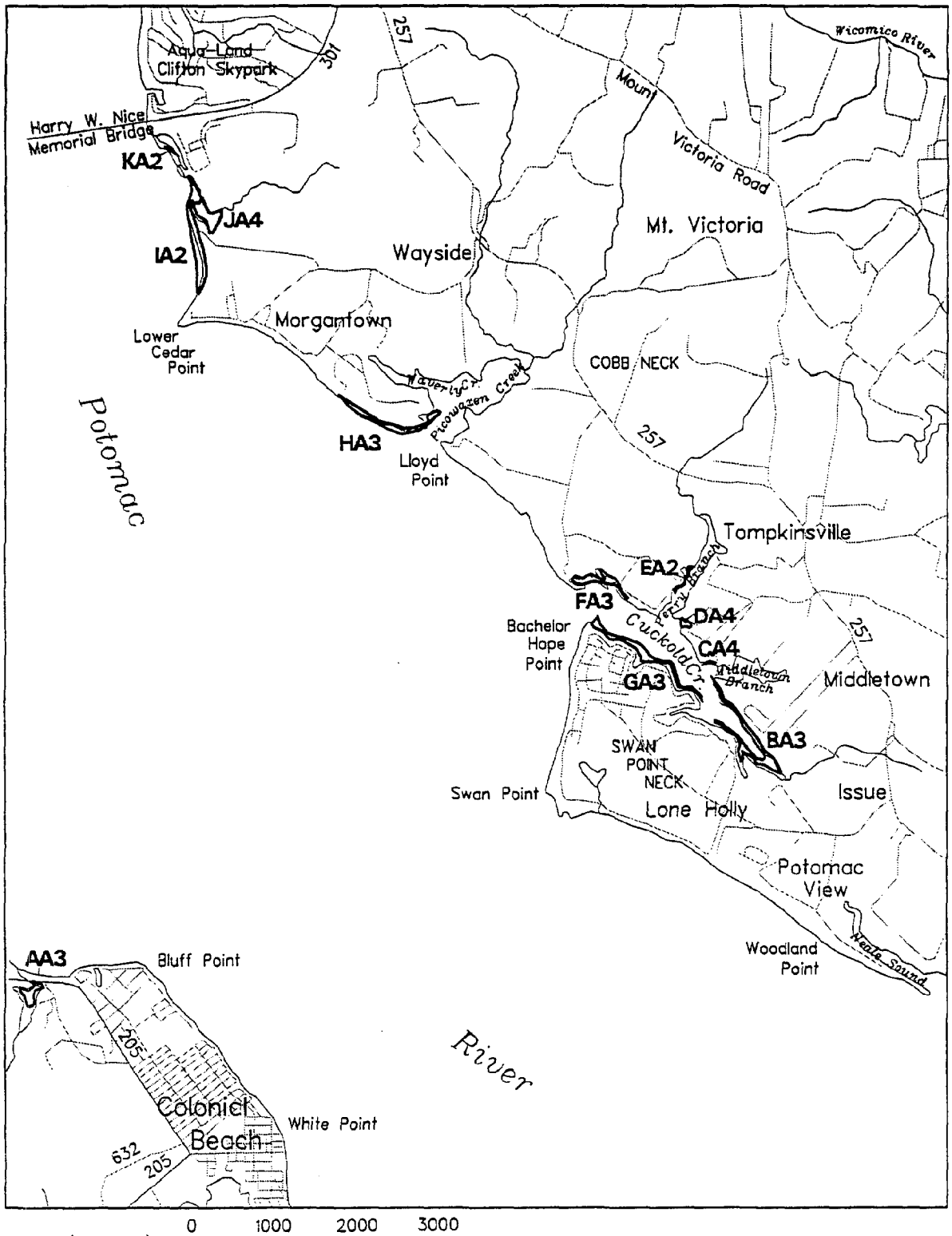
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Colonial Beach North, Md.-Va.(067)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-16-93

Produced by:
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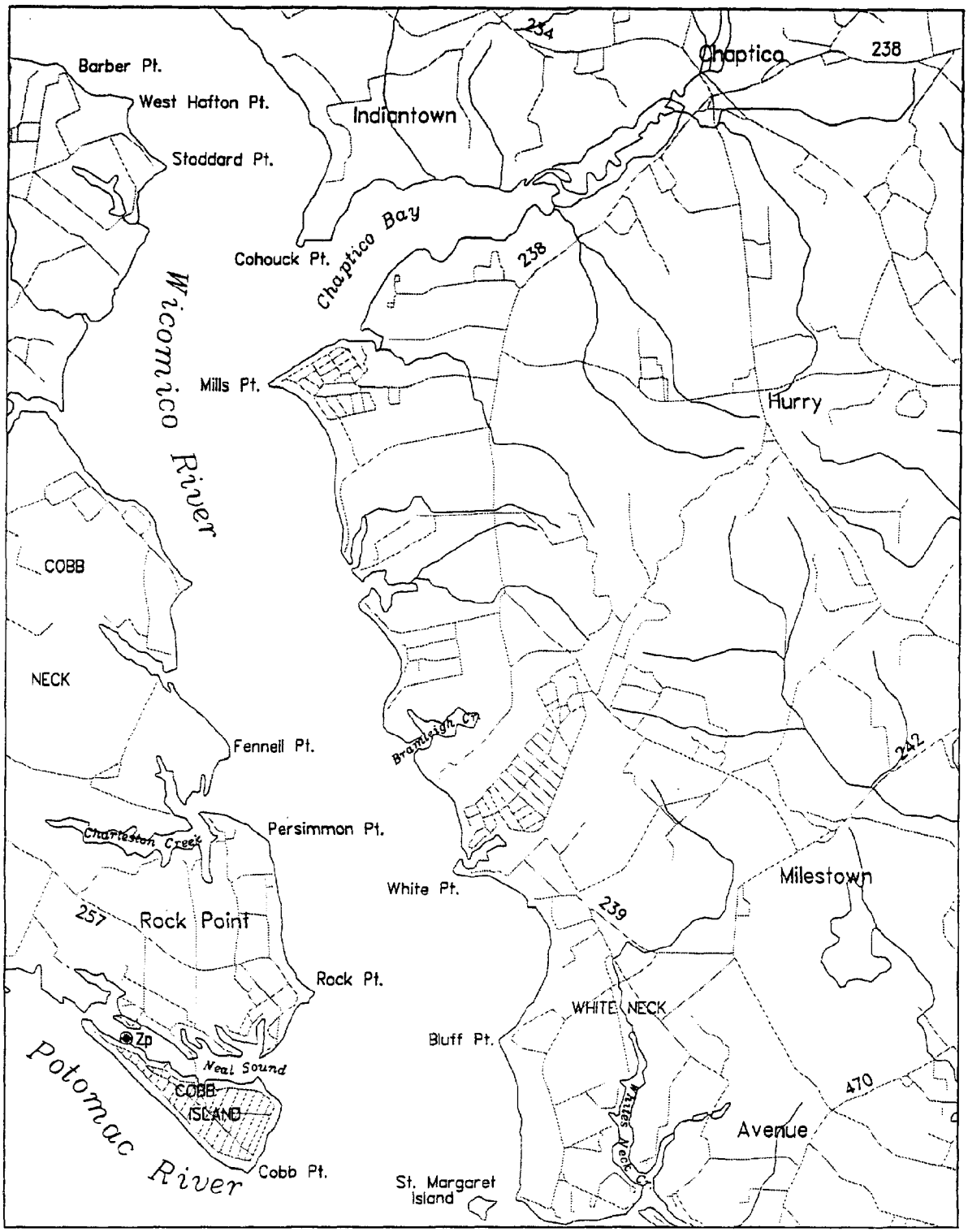
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Rock Point, Md.(068)



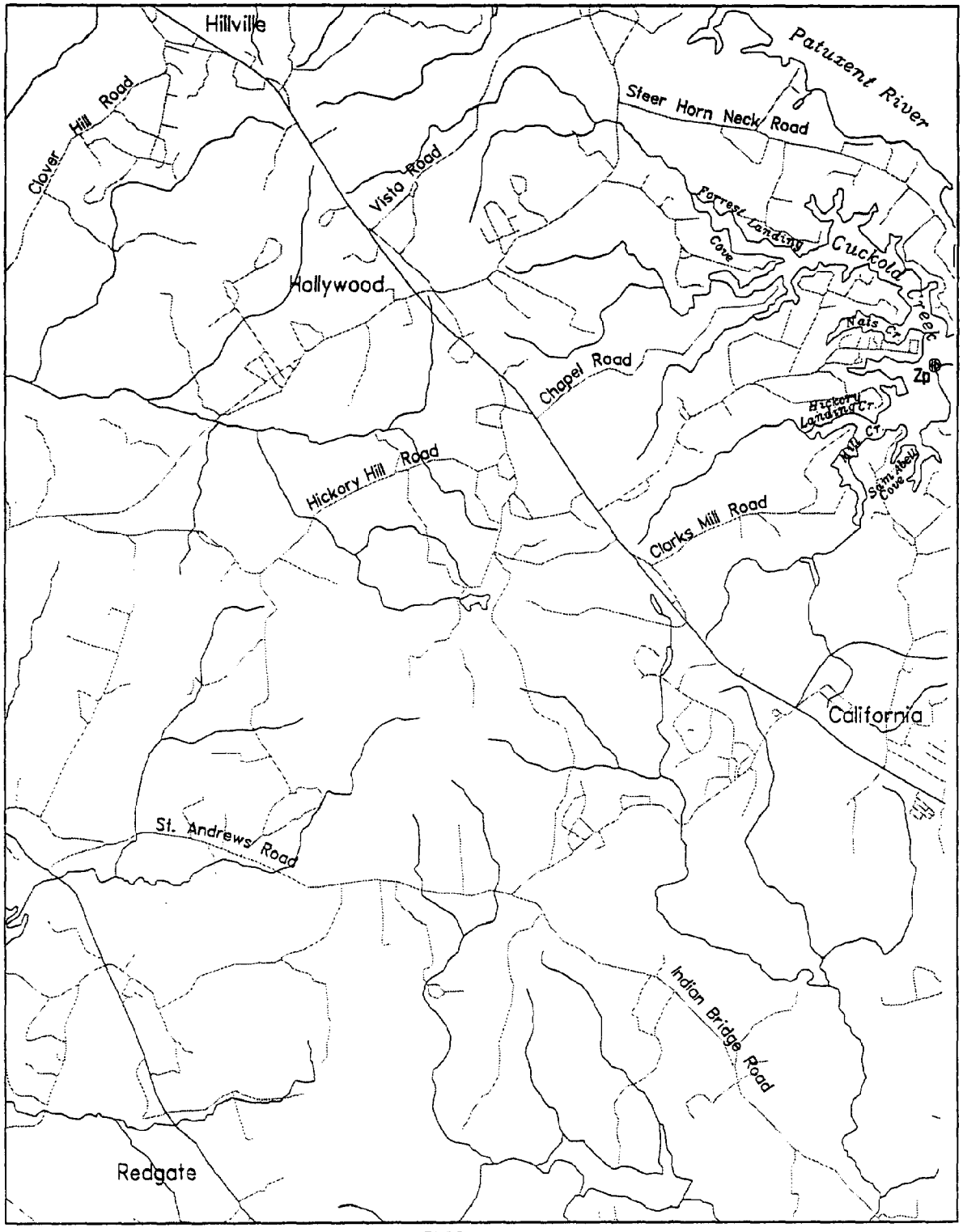
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-16-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Hollywood, Md.(070)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-16-93

Produced by:
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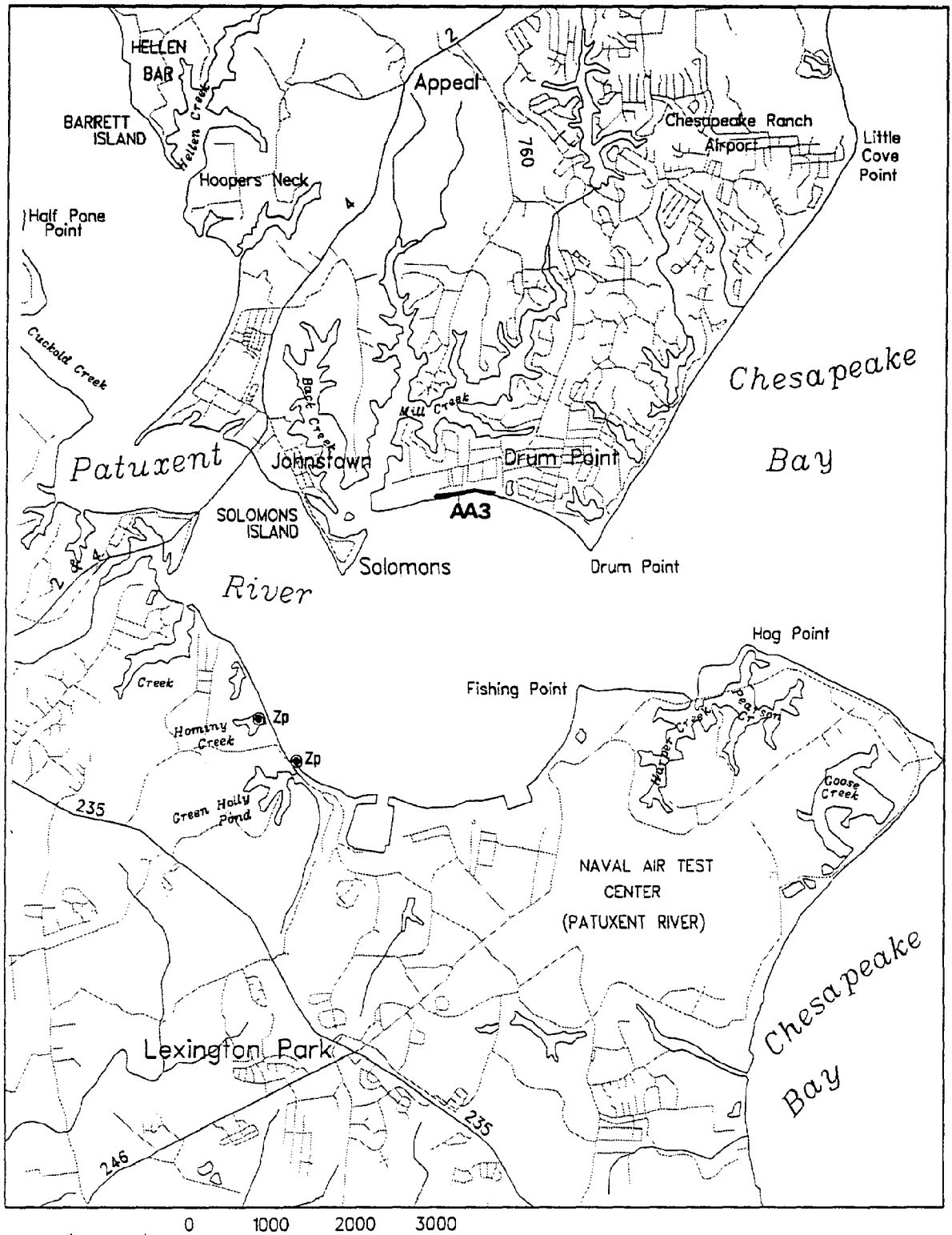
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Solomons Island, Md.(071)



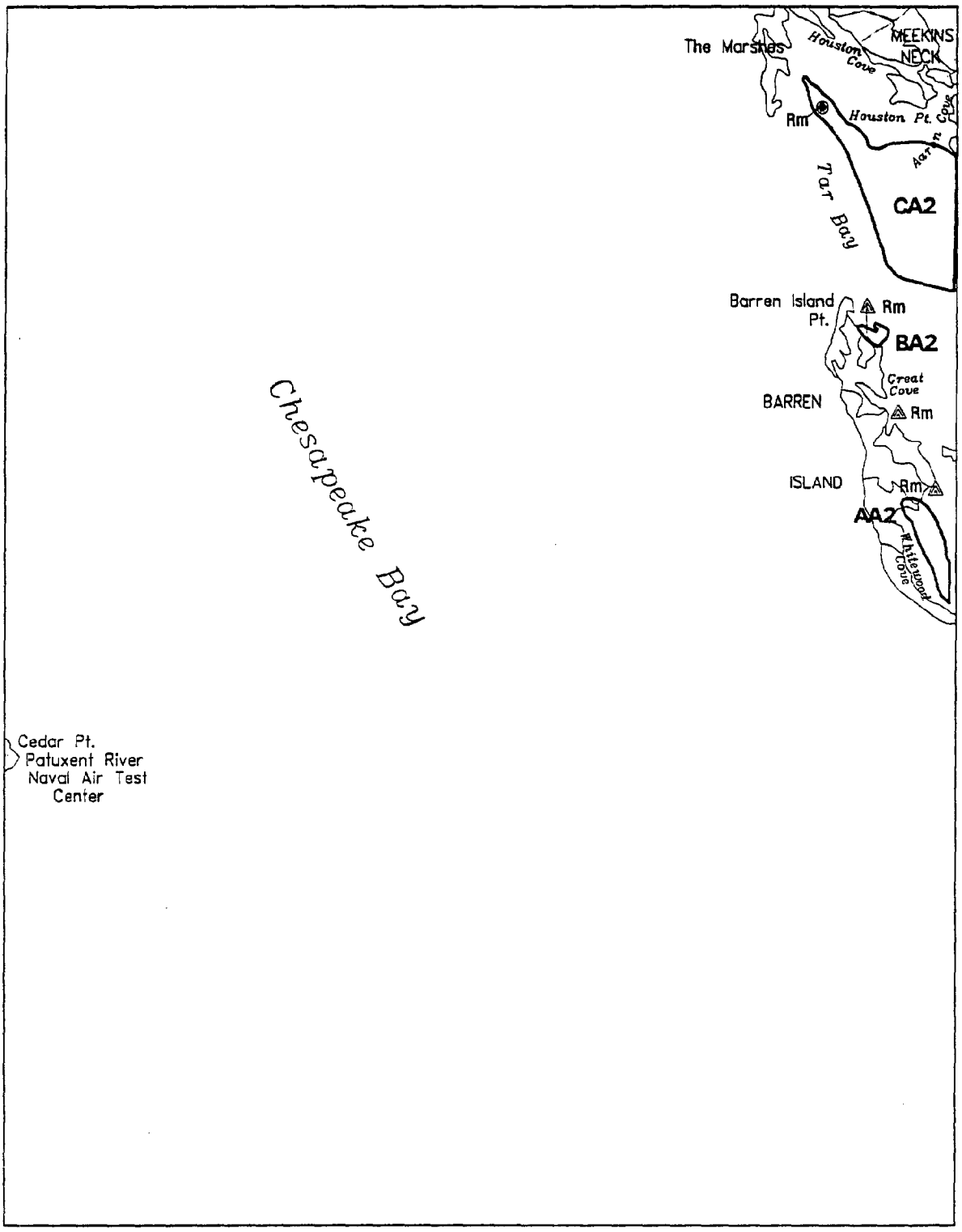
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-16-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Barren Island, Md.(072)



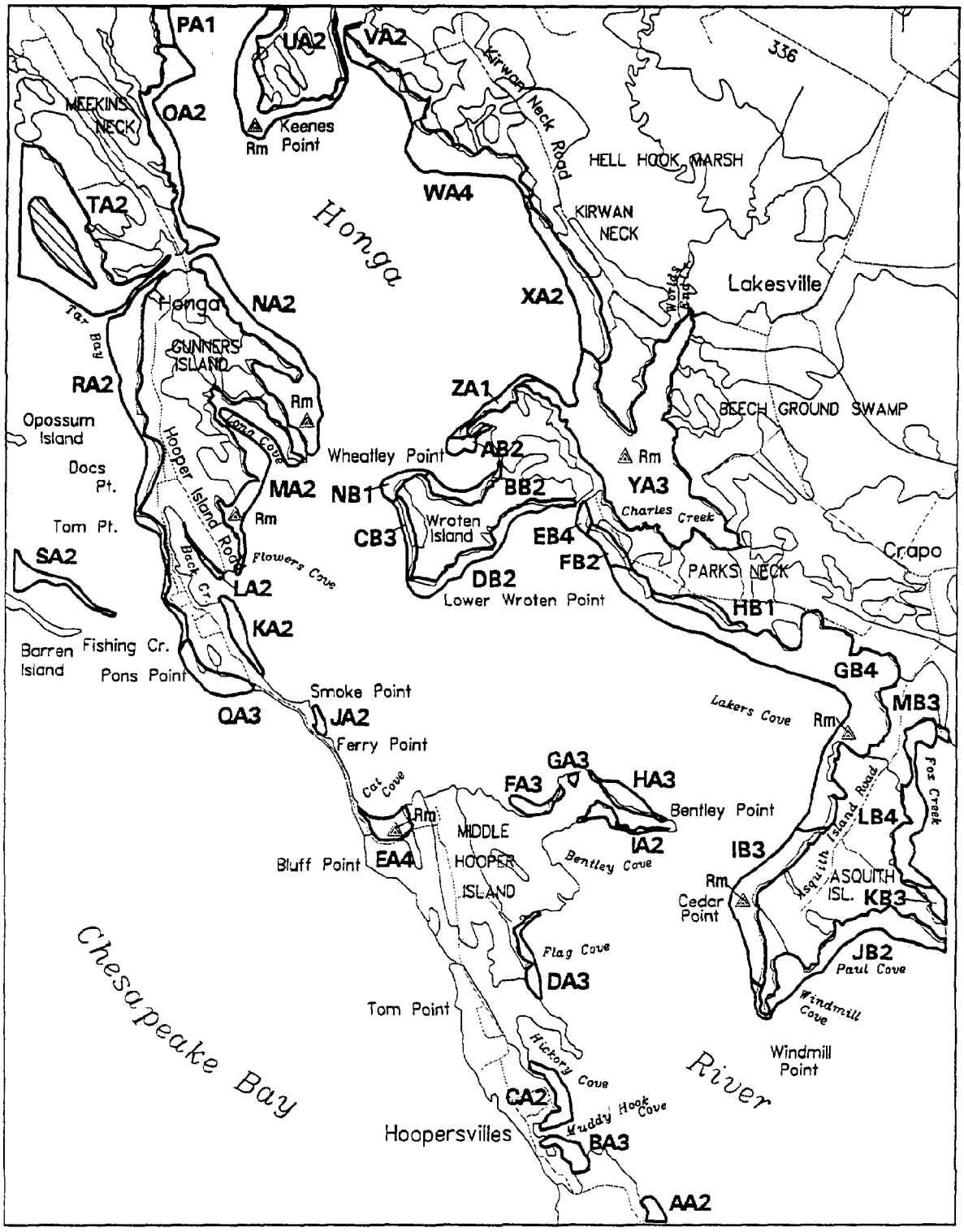
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-24-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Honga, Md.(073)



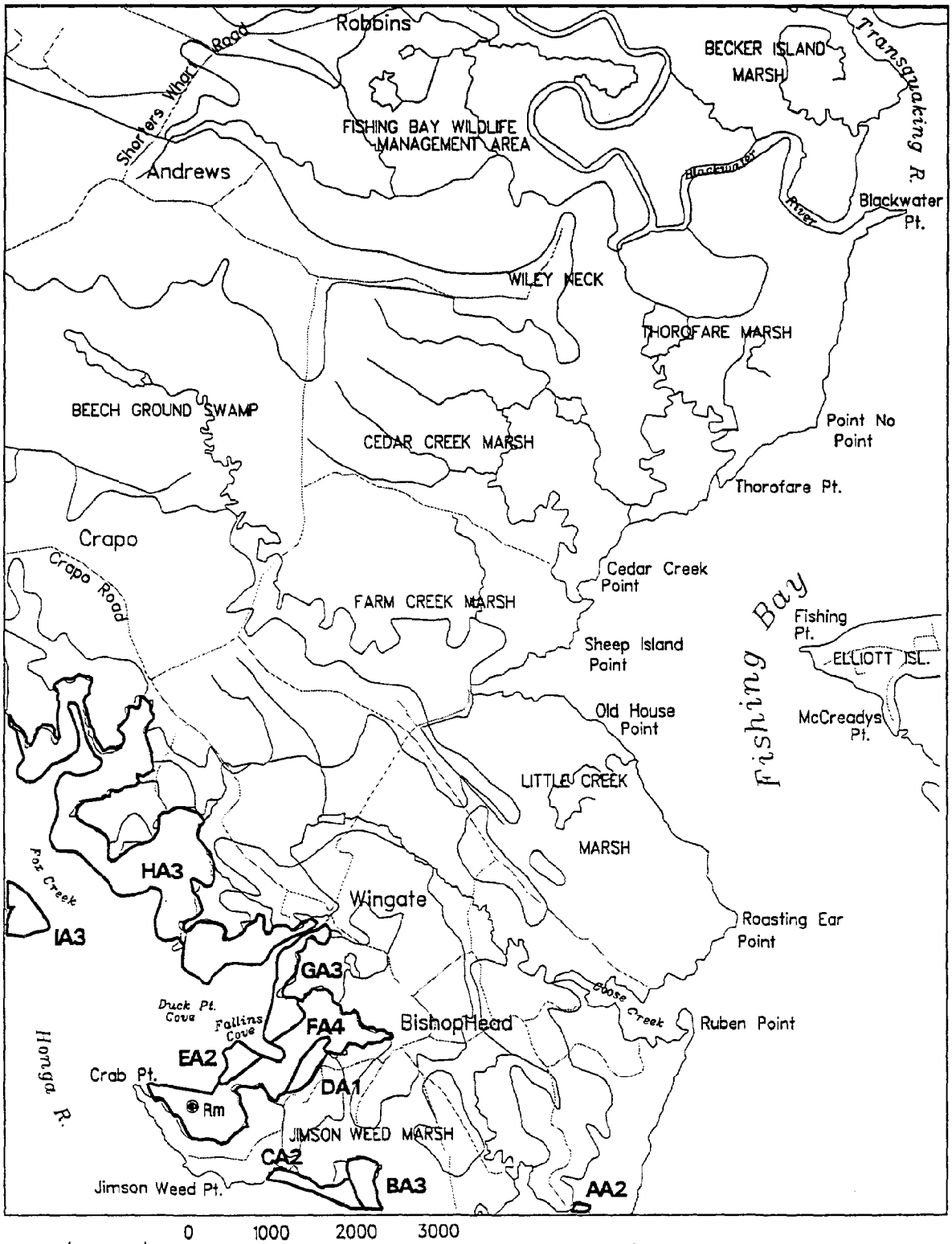
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-24-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Wingate, Md.(074)



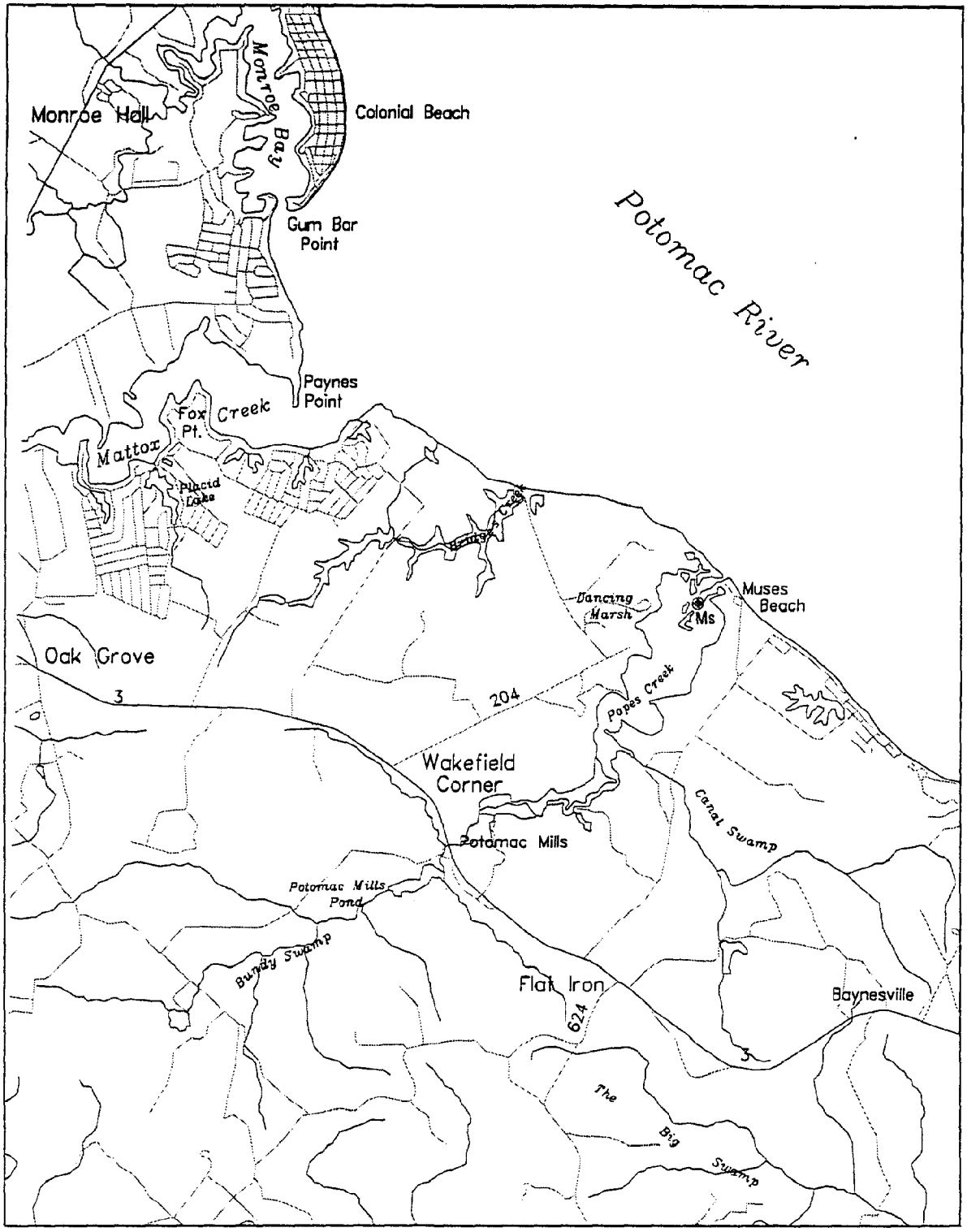
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-23-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Colonial Beach South, Va.-Md.(076)



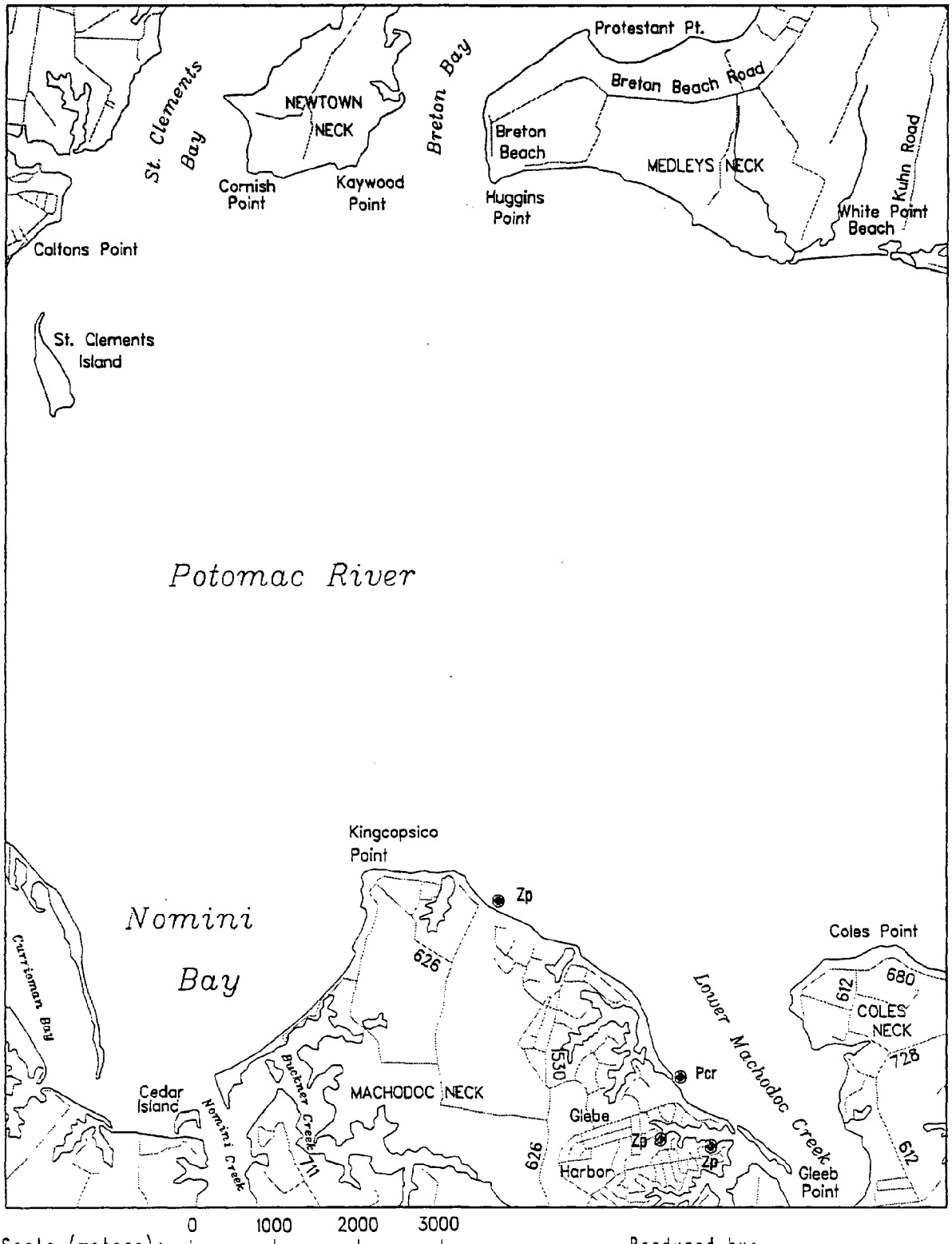
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-17-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
St. Clements Island, Va.-Md.(078)



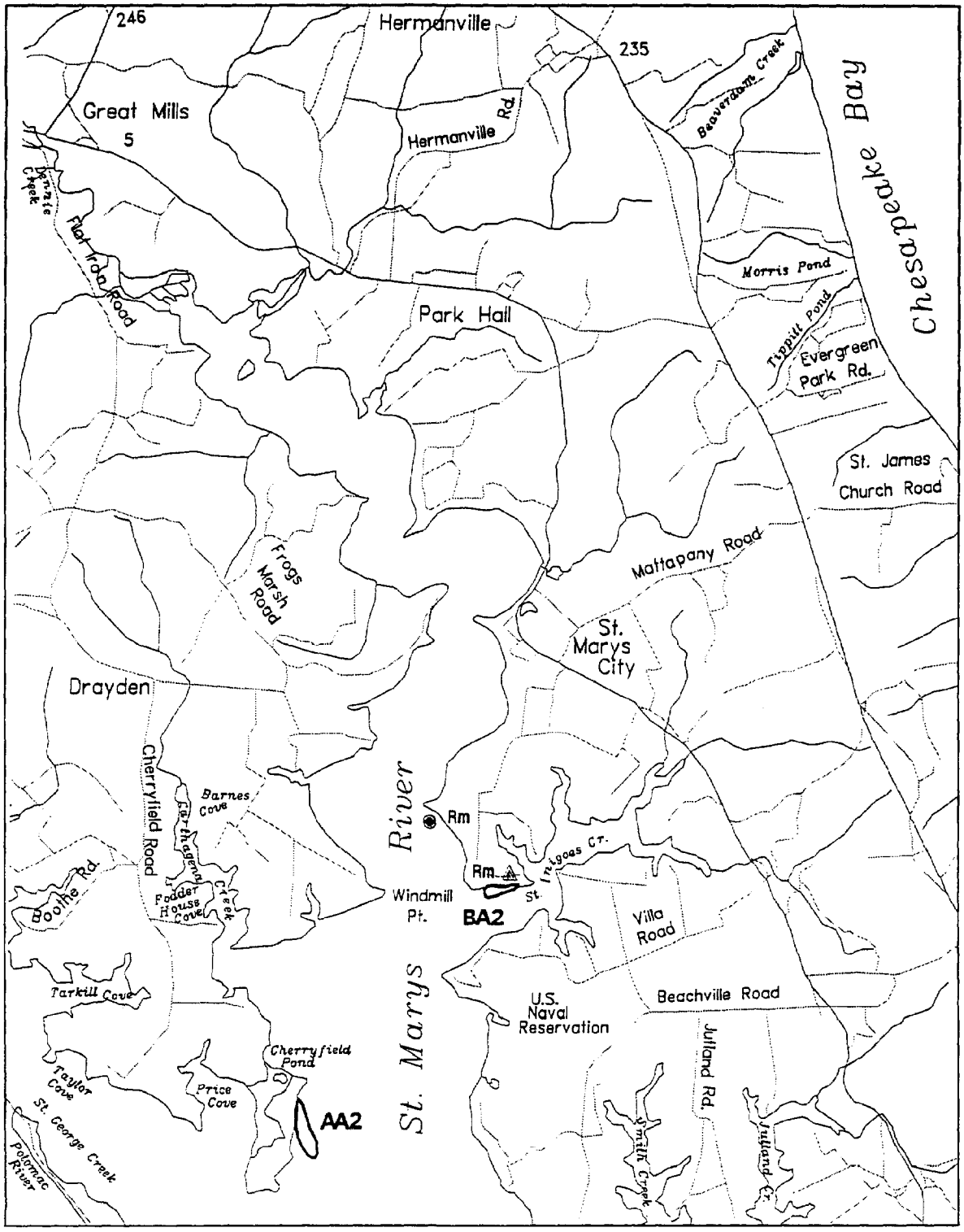
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-17-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
St. Marys City, Md.(080)



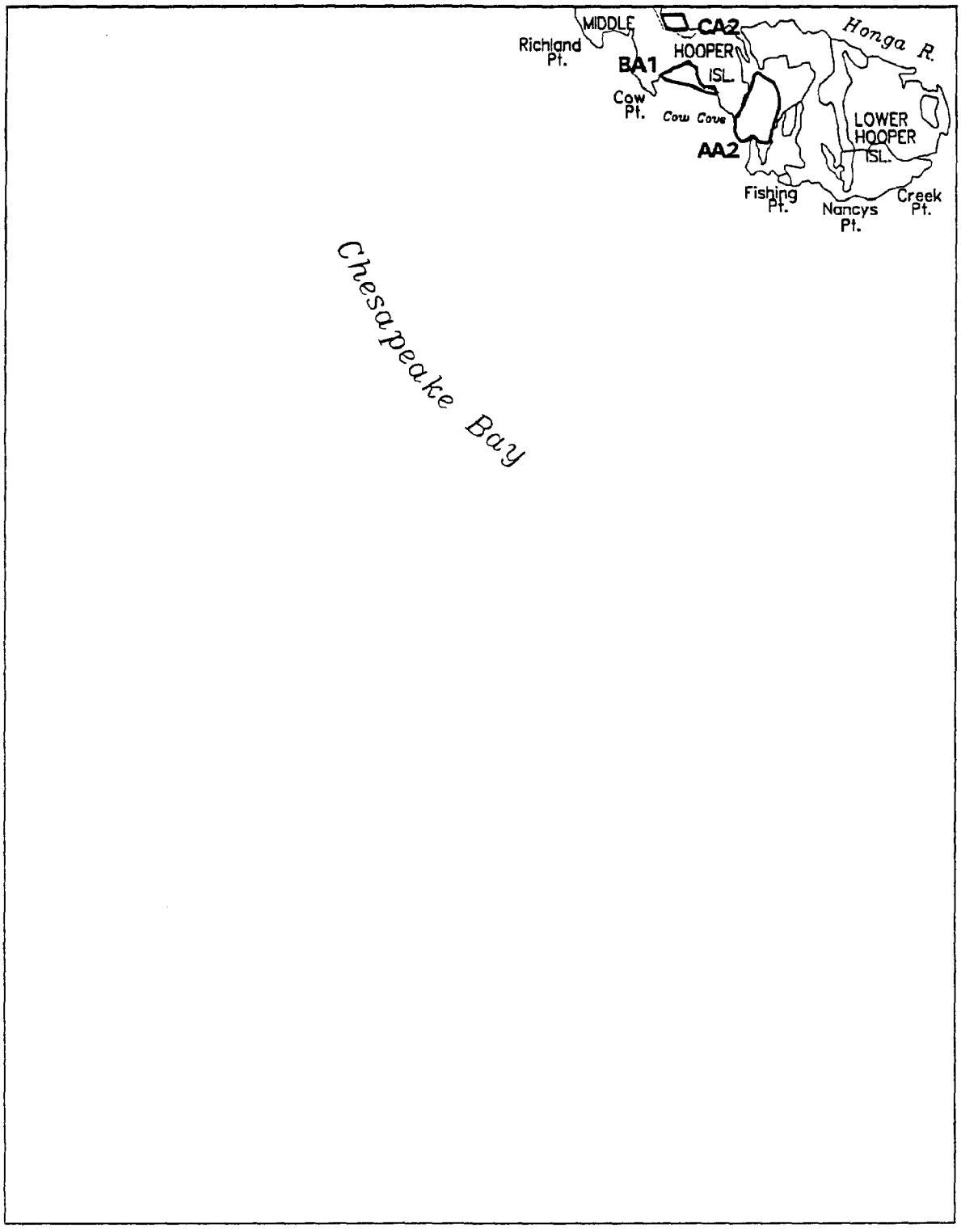
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-18-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Richland Point, Md.(082)



0 1000 2000 3000

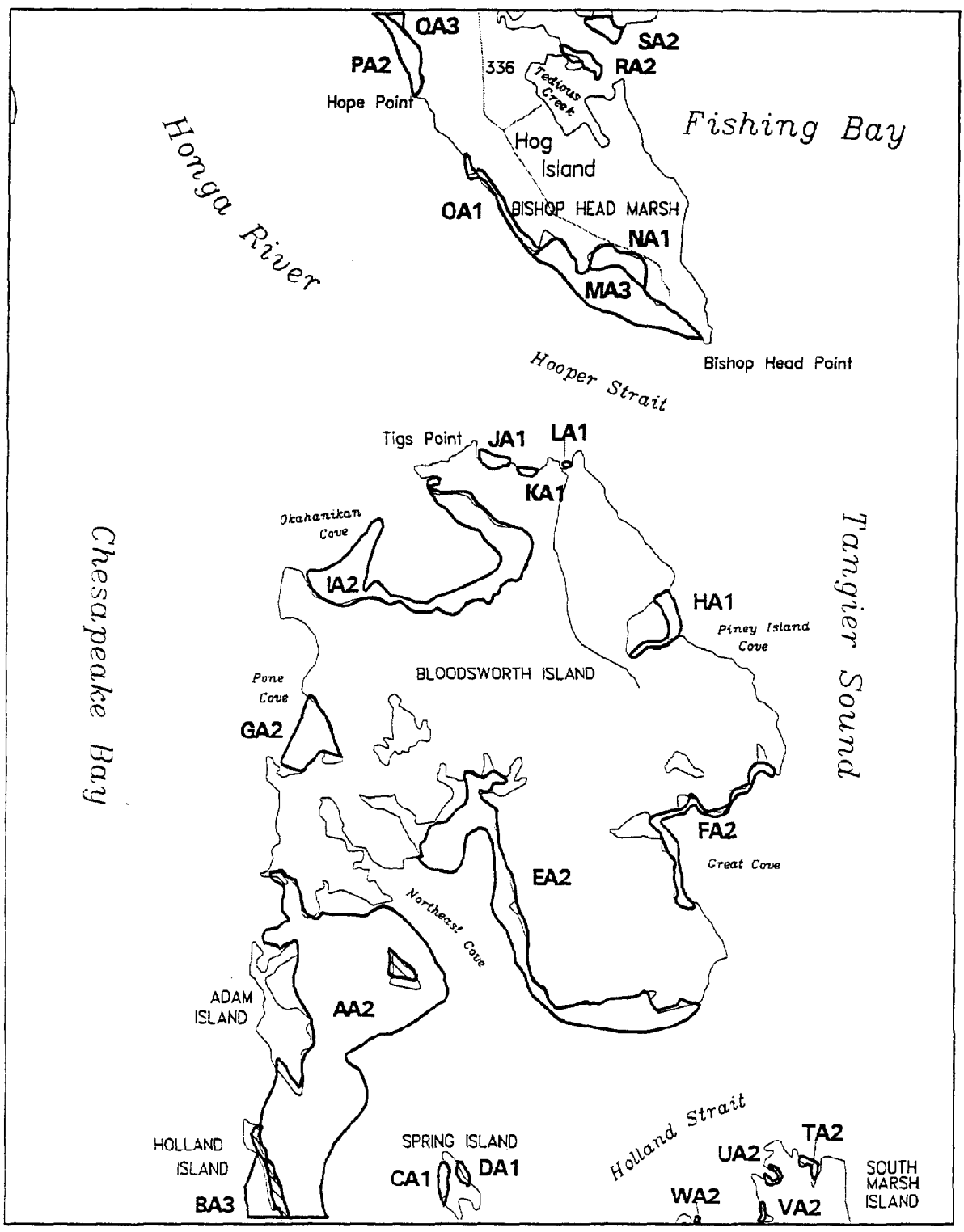
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-24-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Bloodsworth Island, Md.(083)



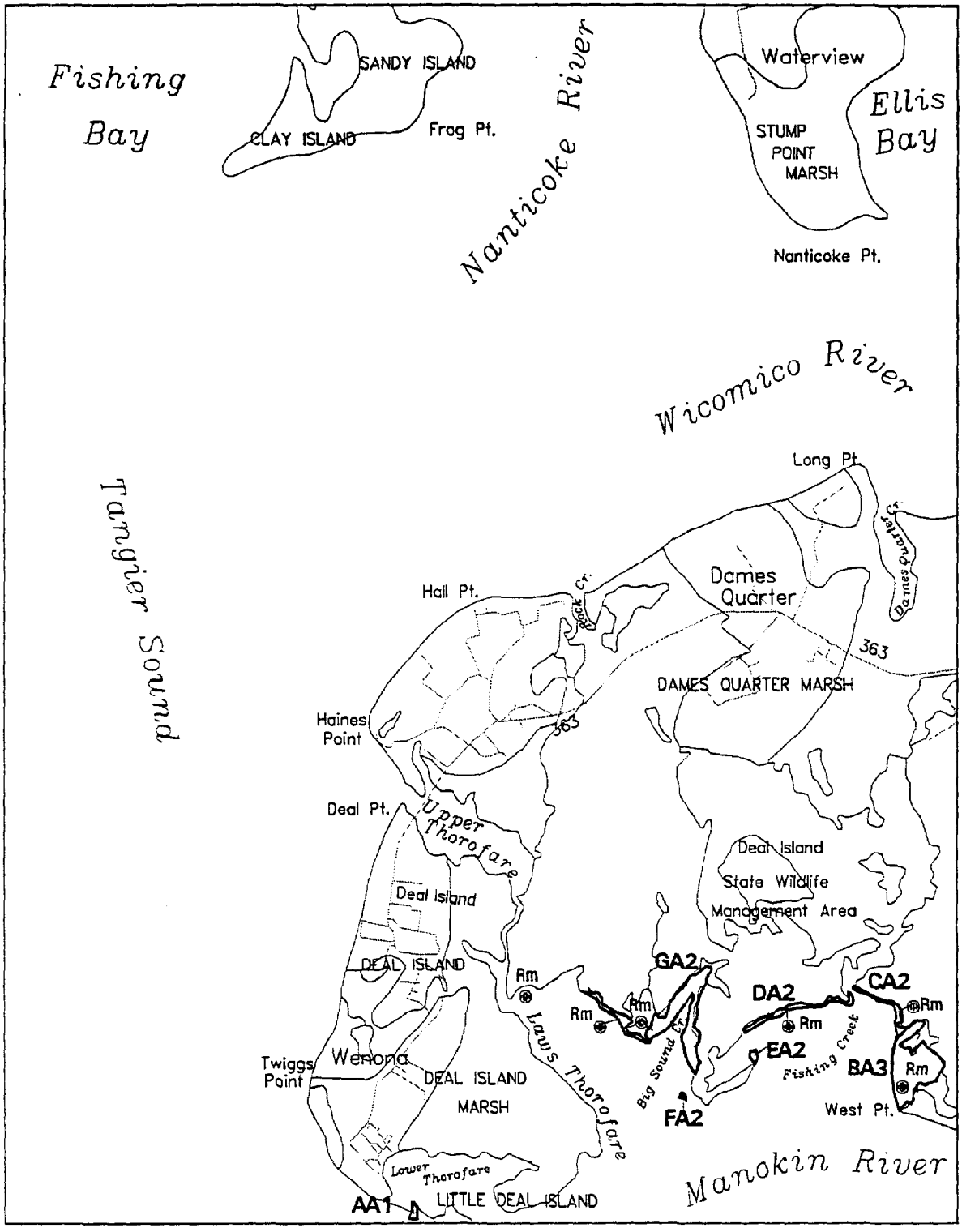
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-23-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Deal Island, Md.(084)



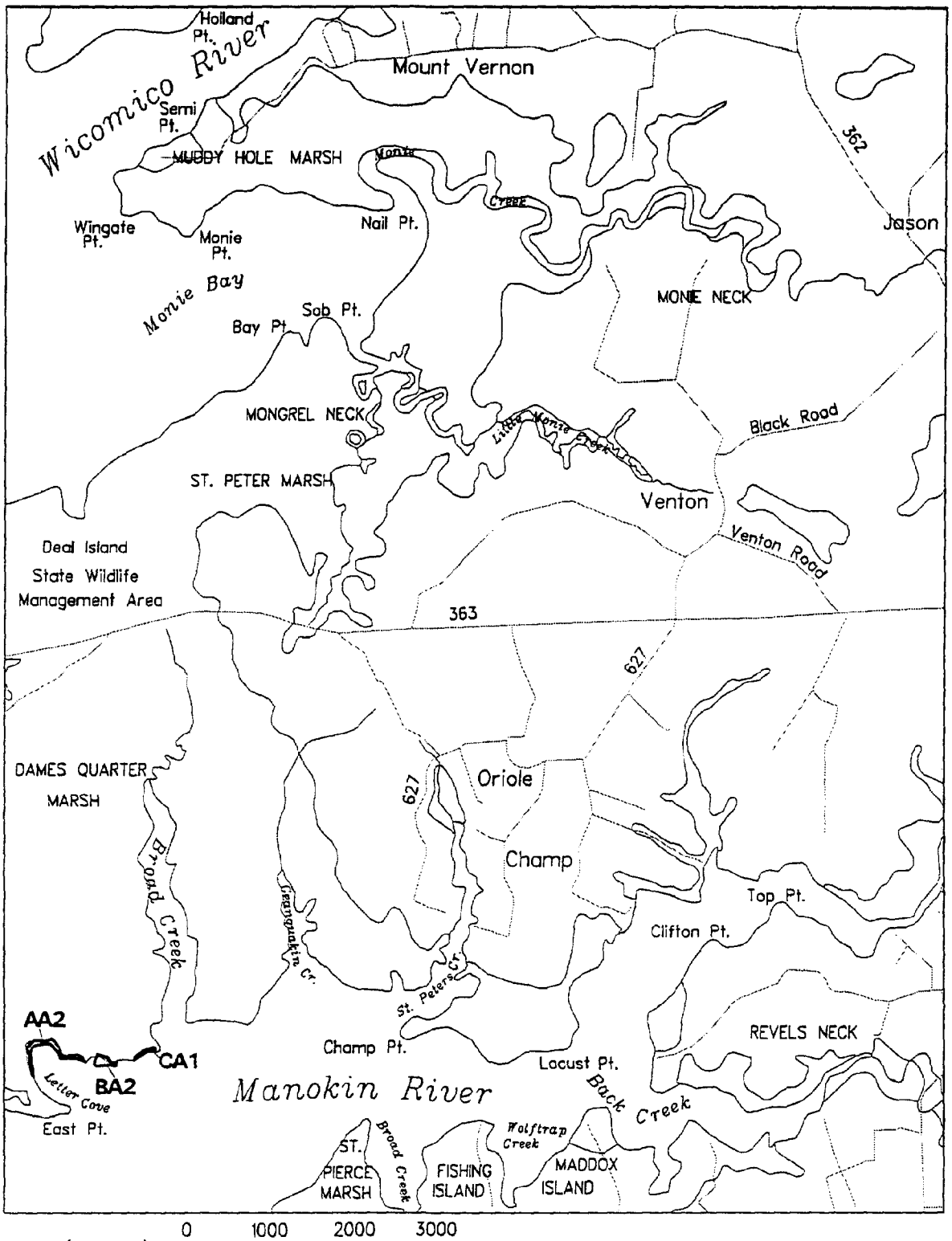
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-23-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Monie, Md.(085)



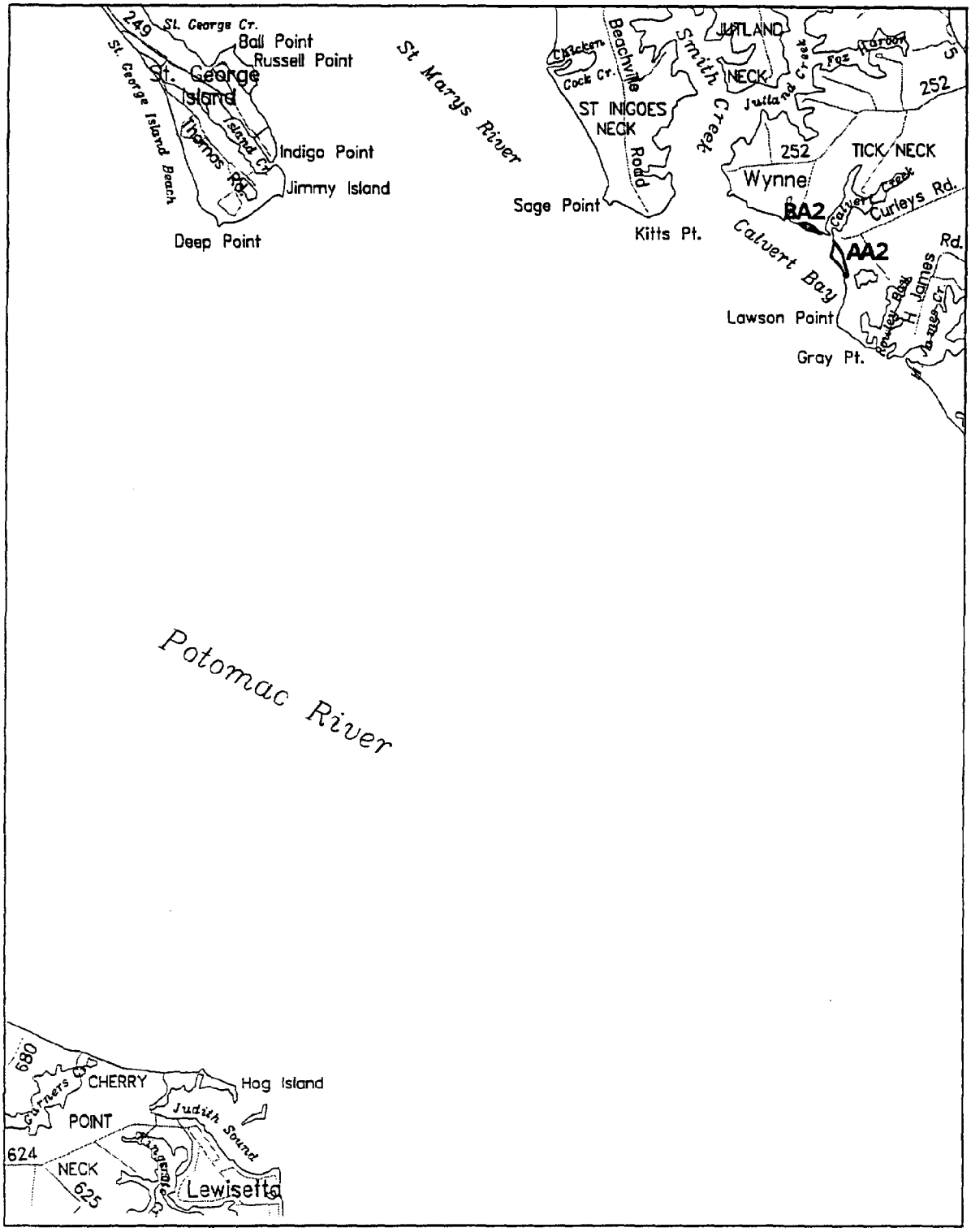
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-23-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
St. George Island, Va.-Md.(089)



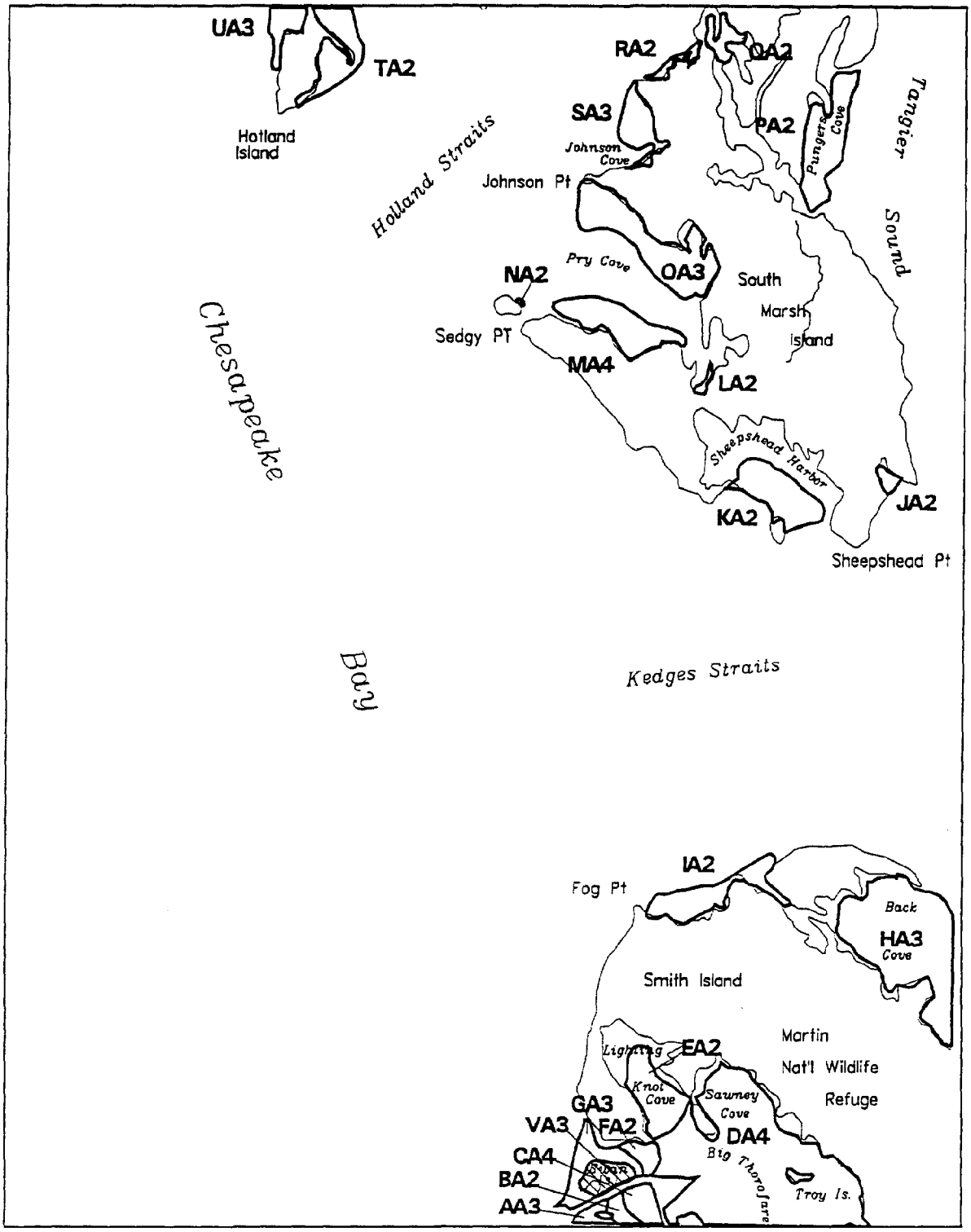
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-17-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Kedges Straits, Md.(091)



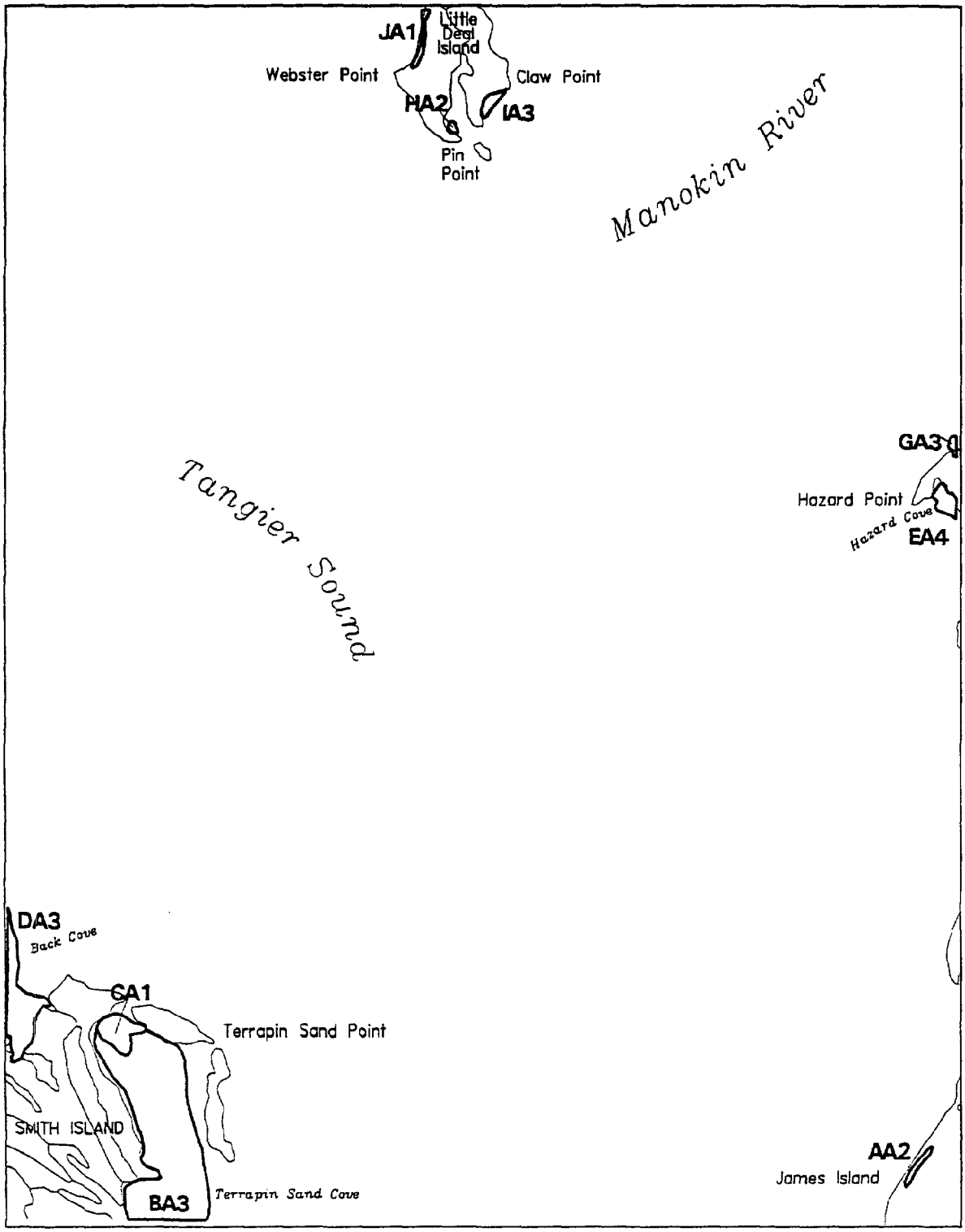
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-24-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Terrapin Sand Point, Md.(092)



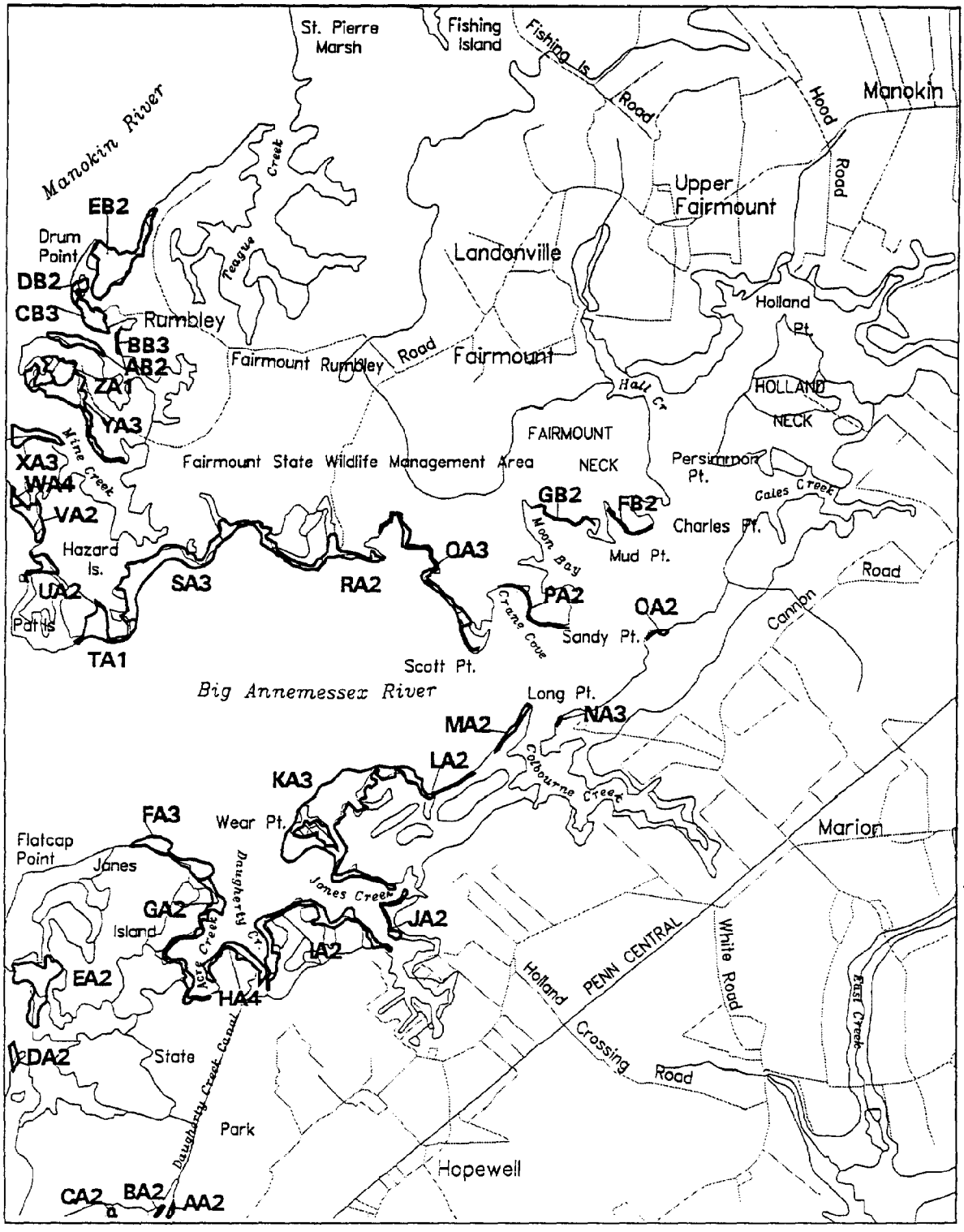
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-23-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Marion, Md.(093)



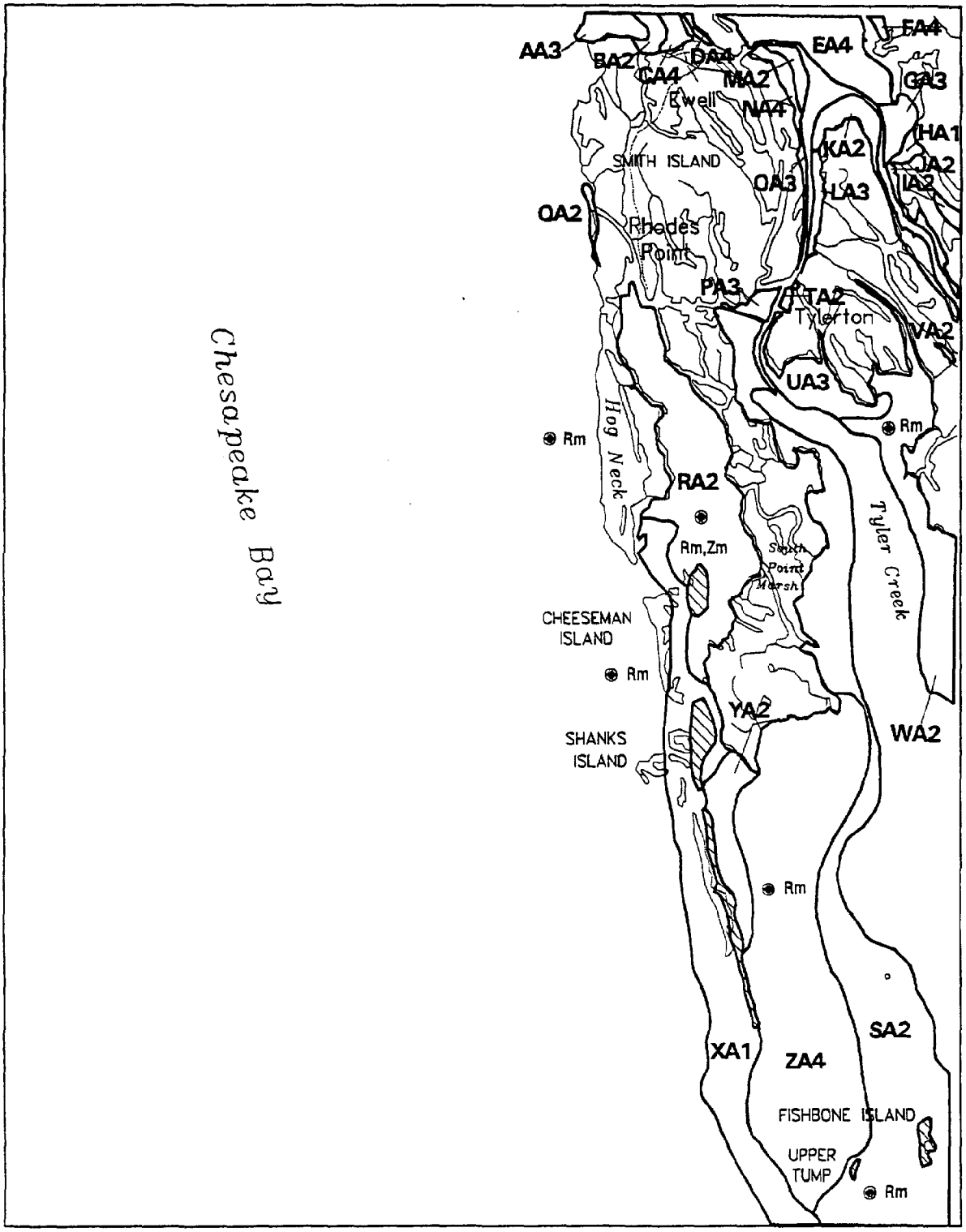
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-24-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Ewell, Md.-Va.(099)



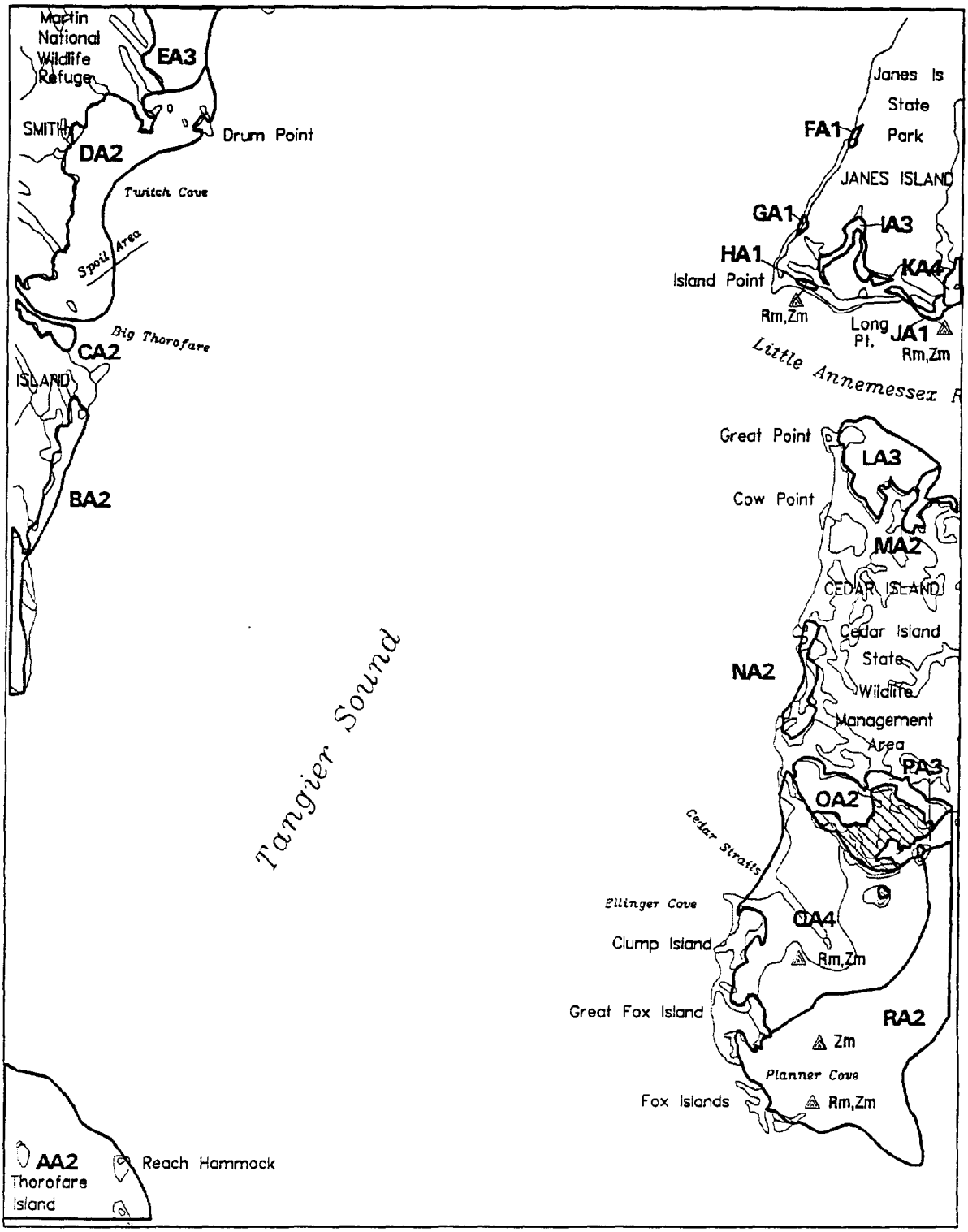
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-24-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Great Fox Island, Va.-Md.(100)



0 1000 2000 3000

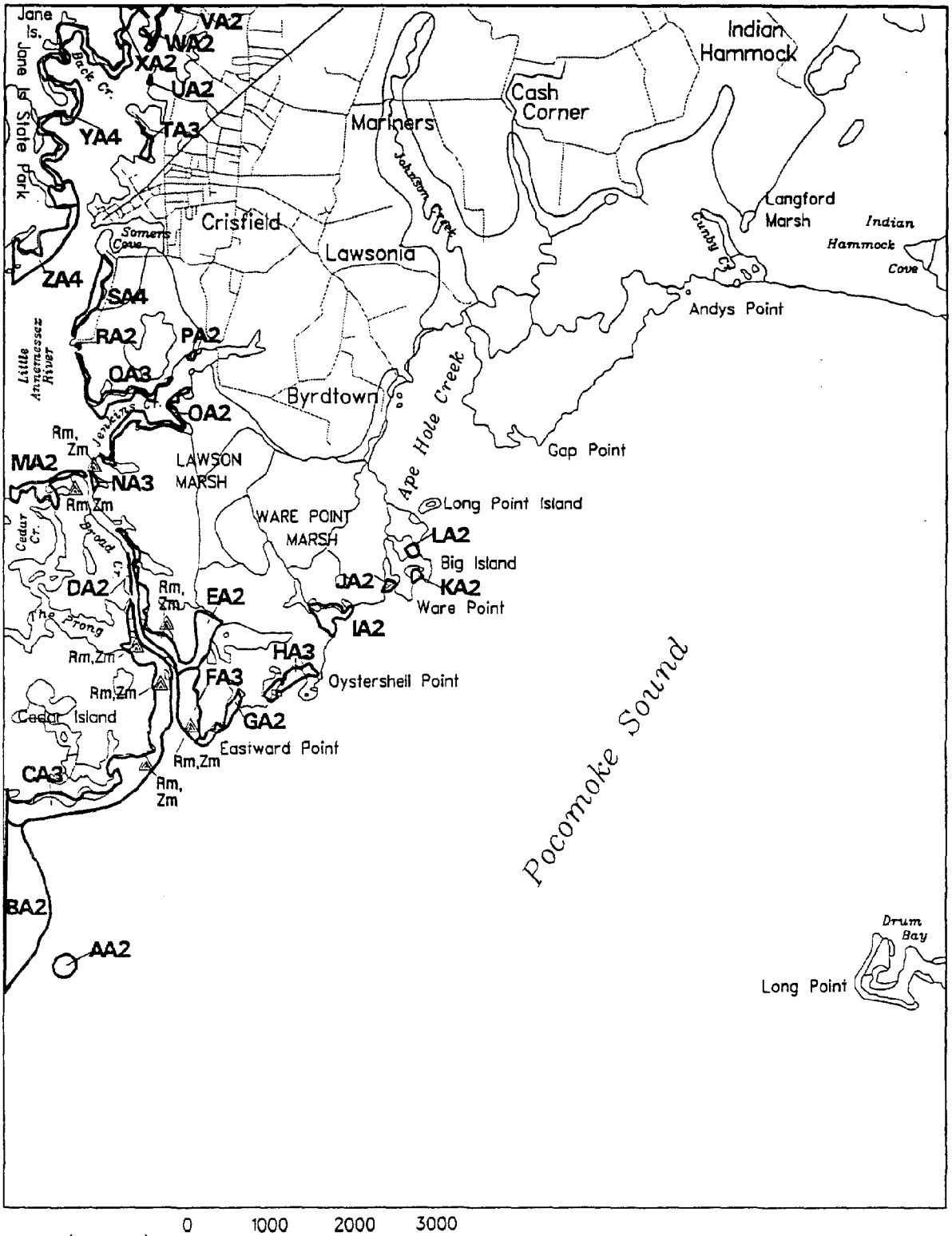
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-24-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Crisfield, Md.-Va.(101)



0 1000 2000 3000

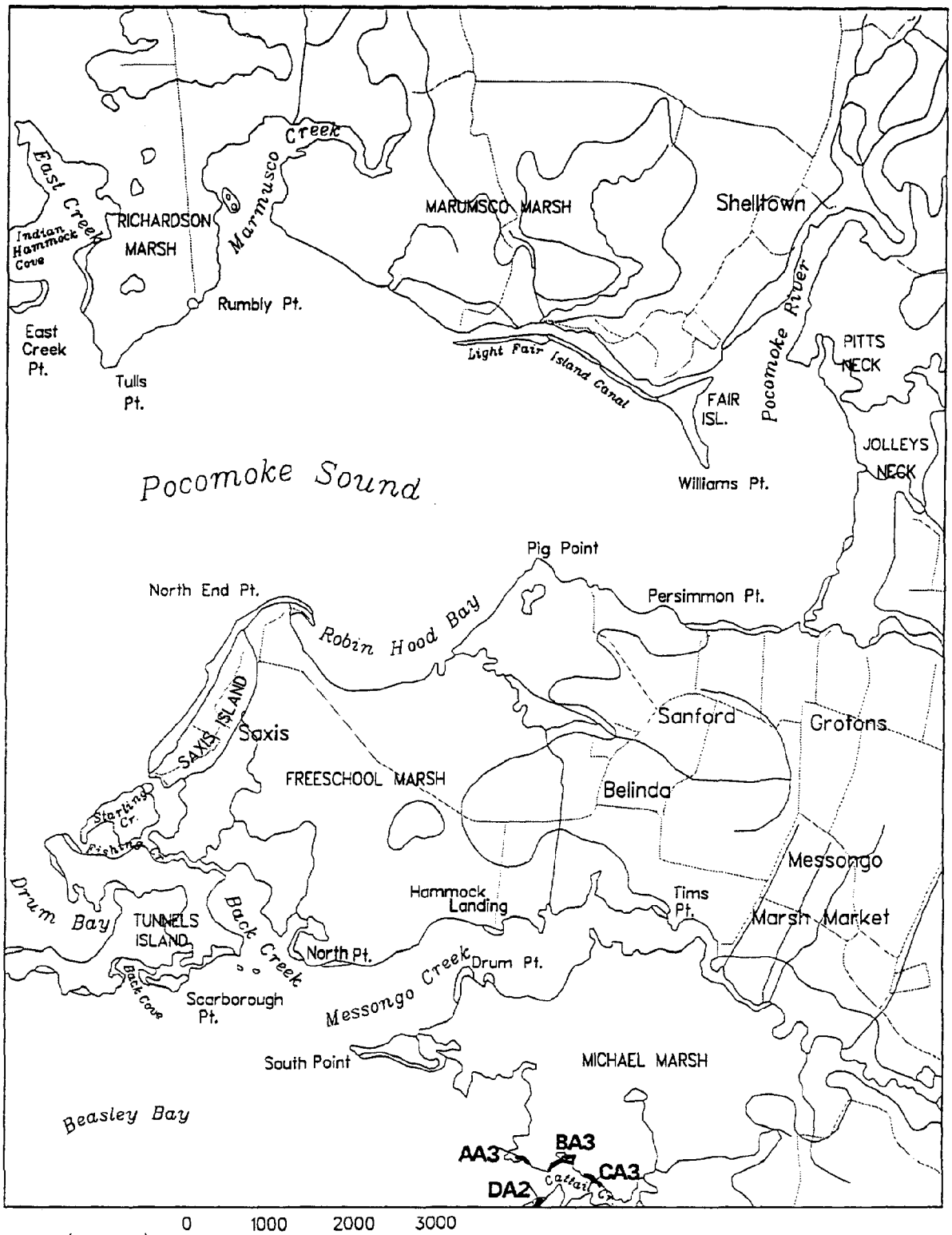
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-24-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Saxis, Va.-Md.(102)



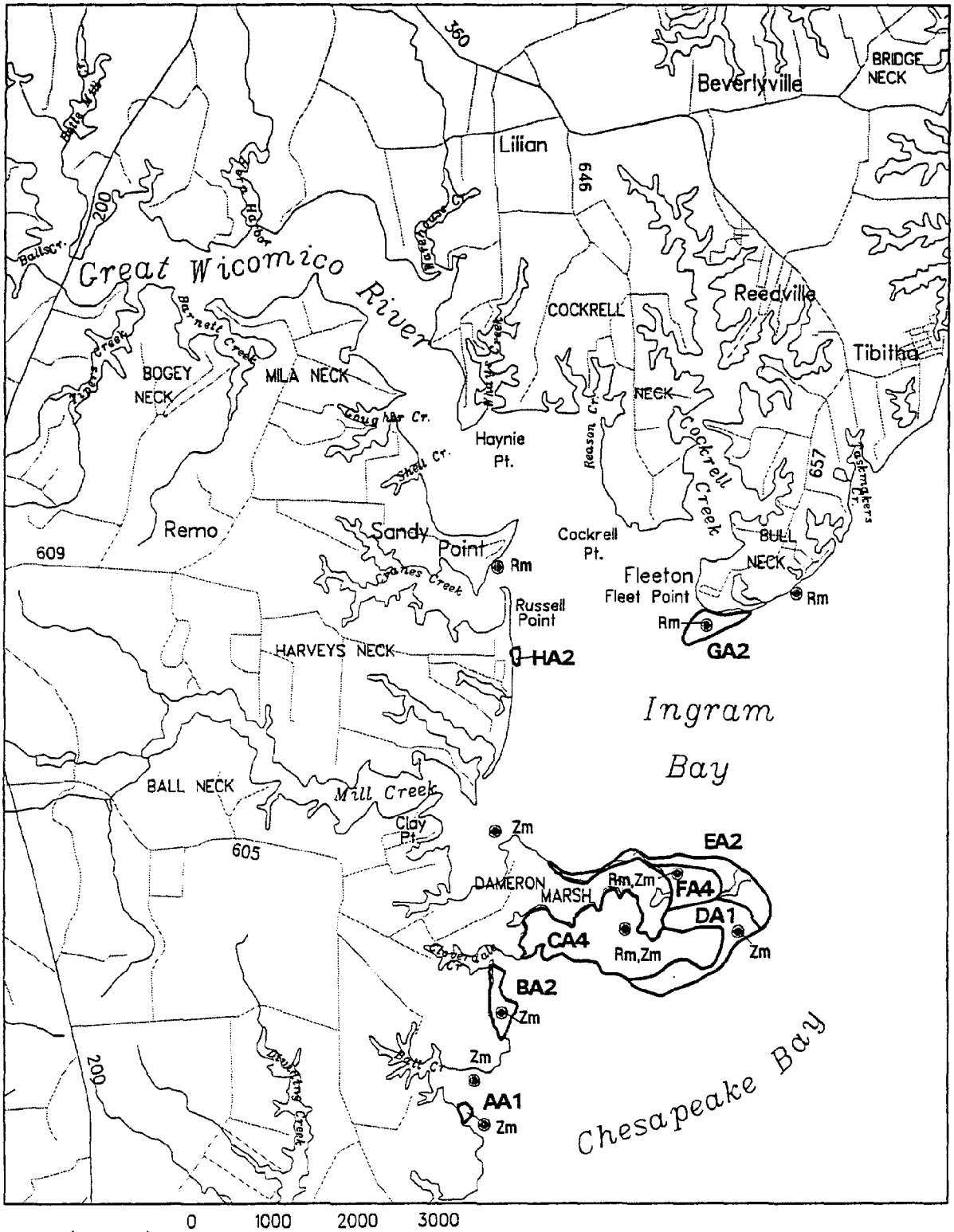
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-10-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Reedville, Va.(106)



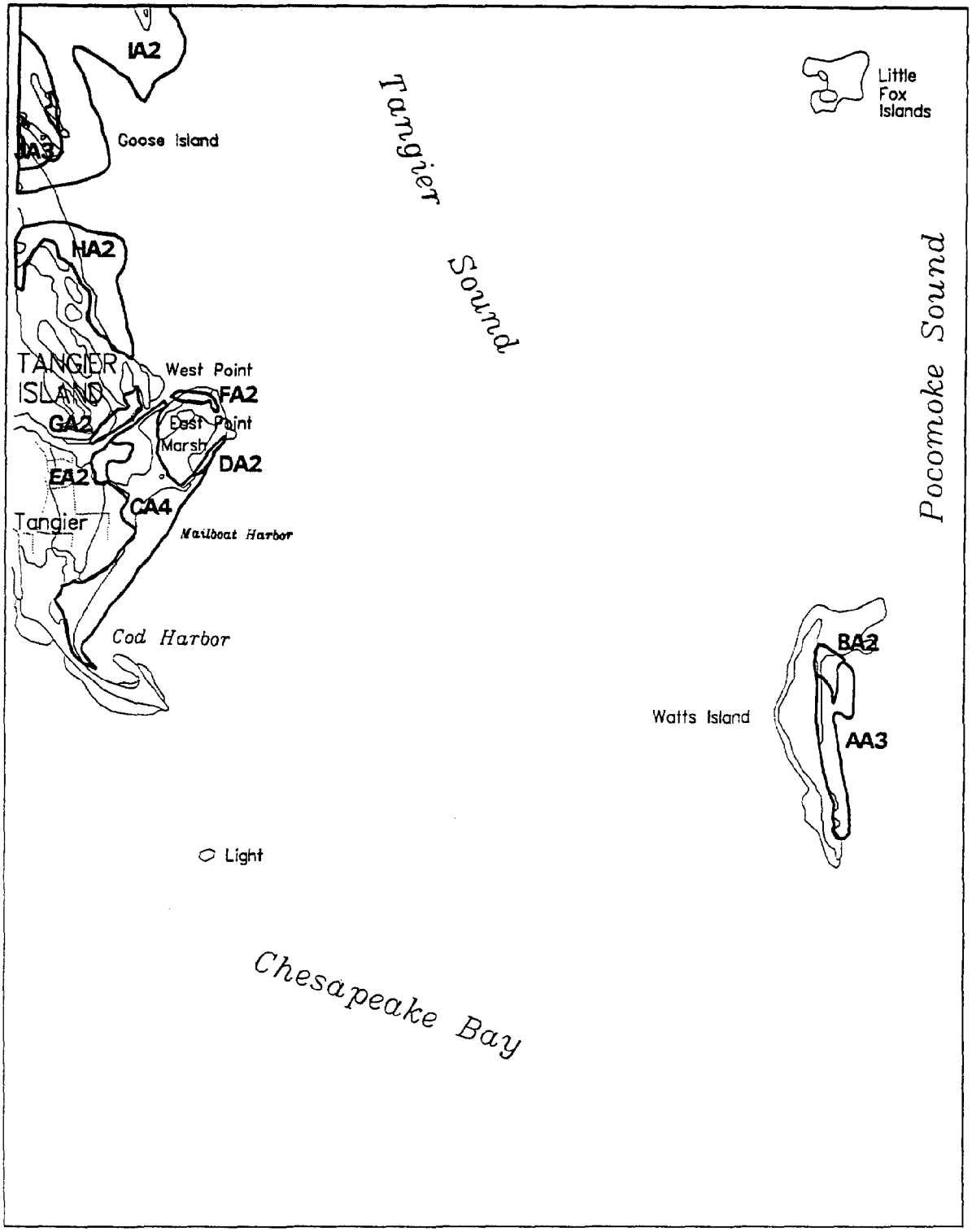
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-24-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Tangier Island, Va.(107)

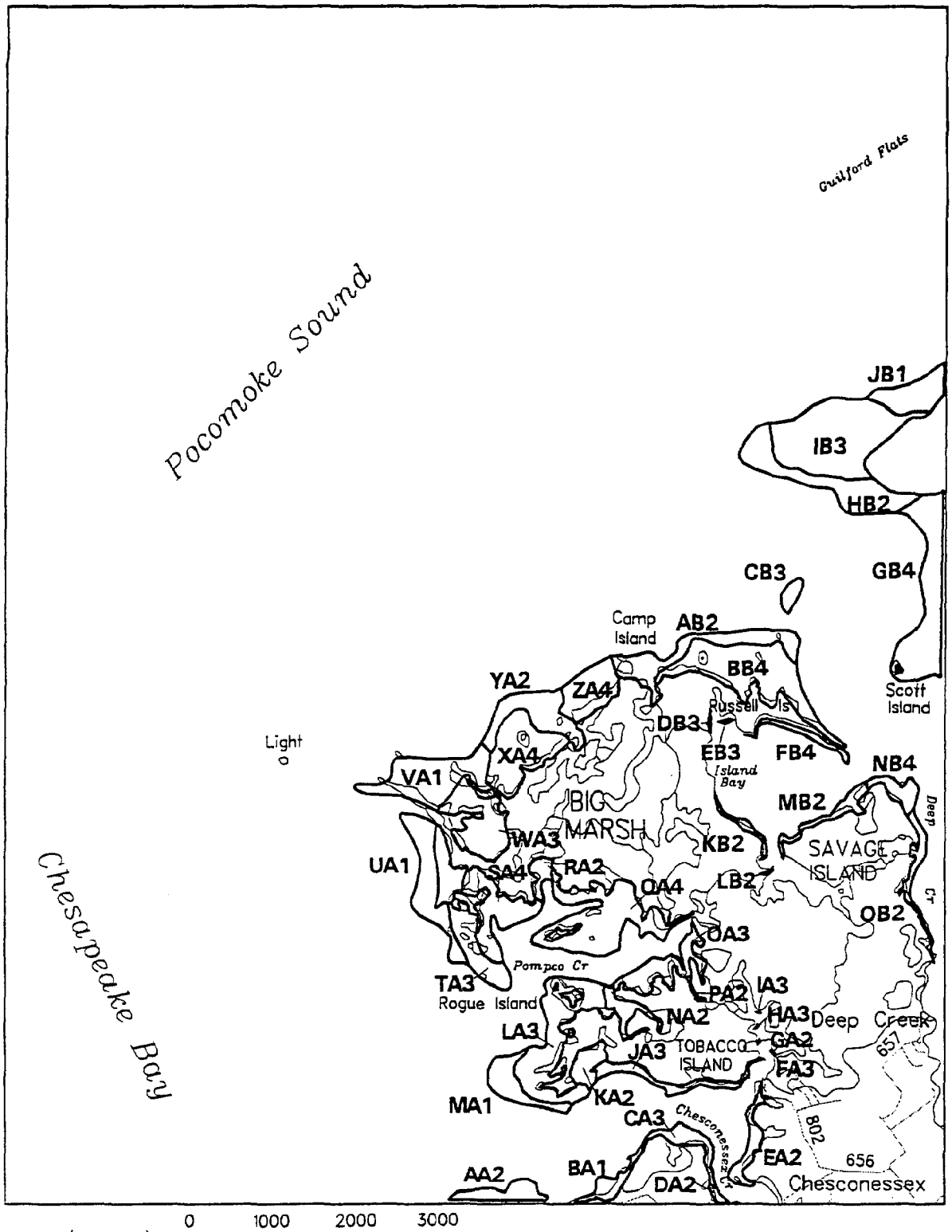


Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey
Date Flown: 6-24-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Chesconessex, Va.(108)



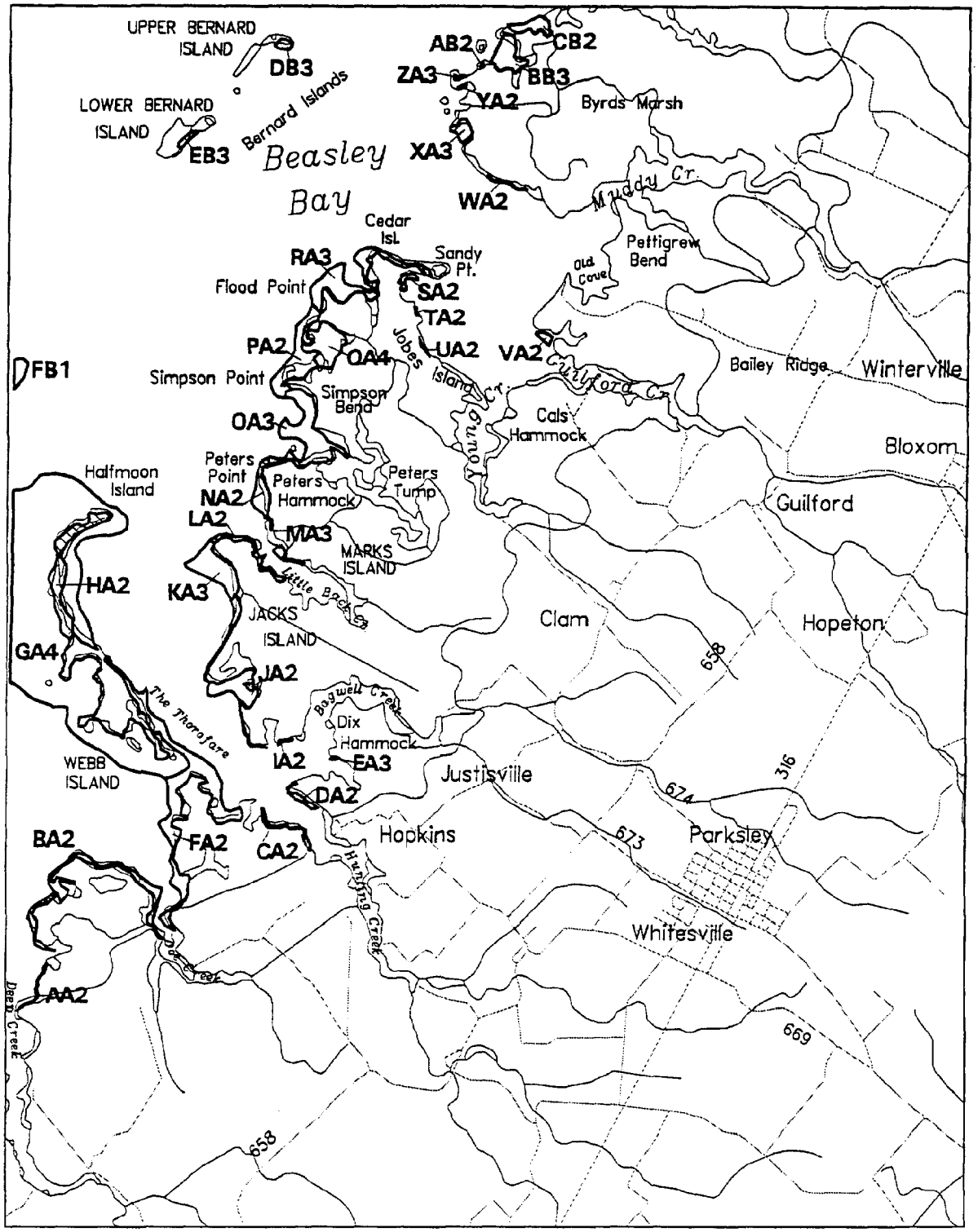
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-7-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Parksley, Va.(109)



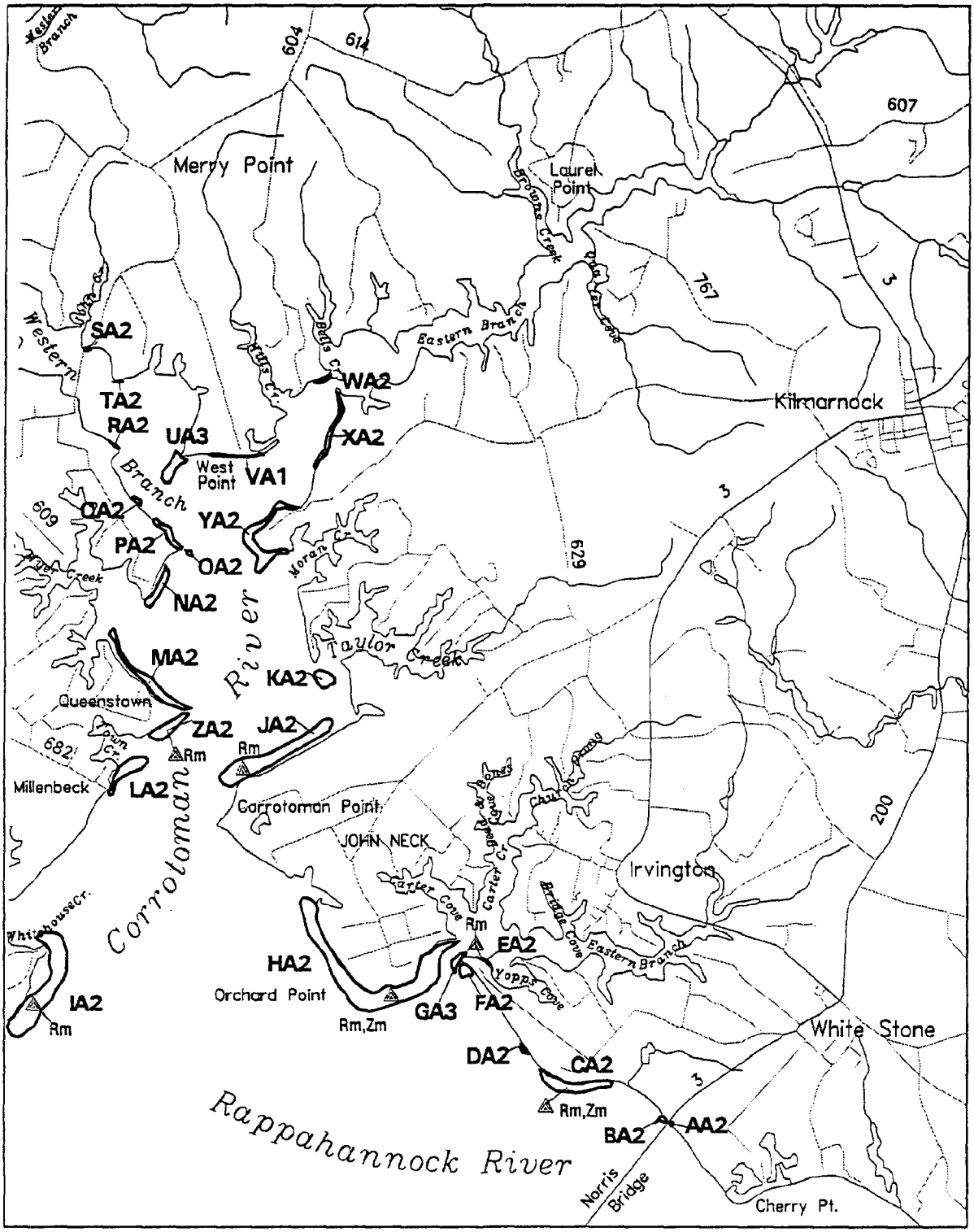
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-7-936

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Irvington, Va.(111)



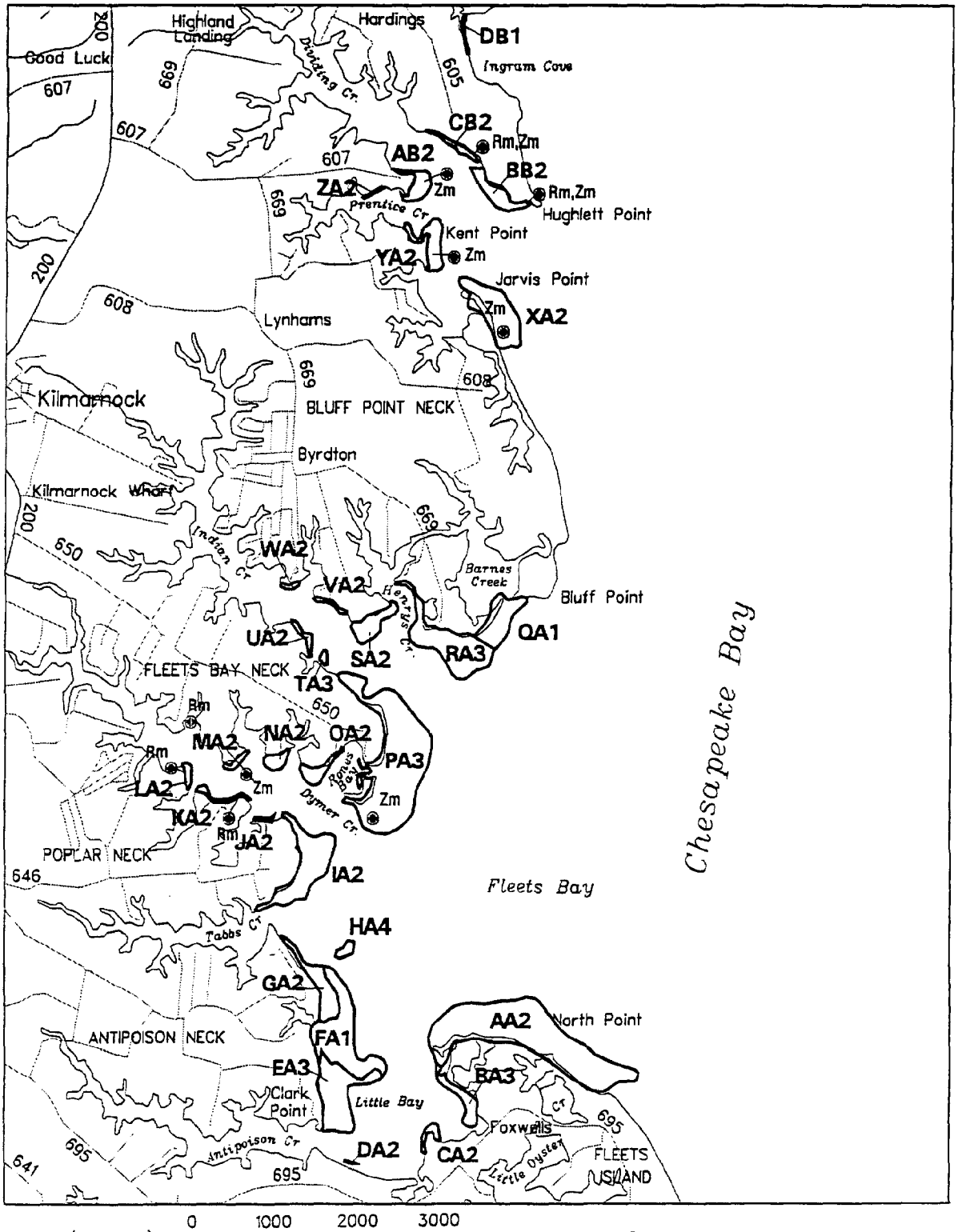
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-7-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Fleets Bay, Va.(112)



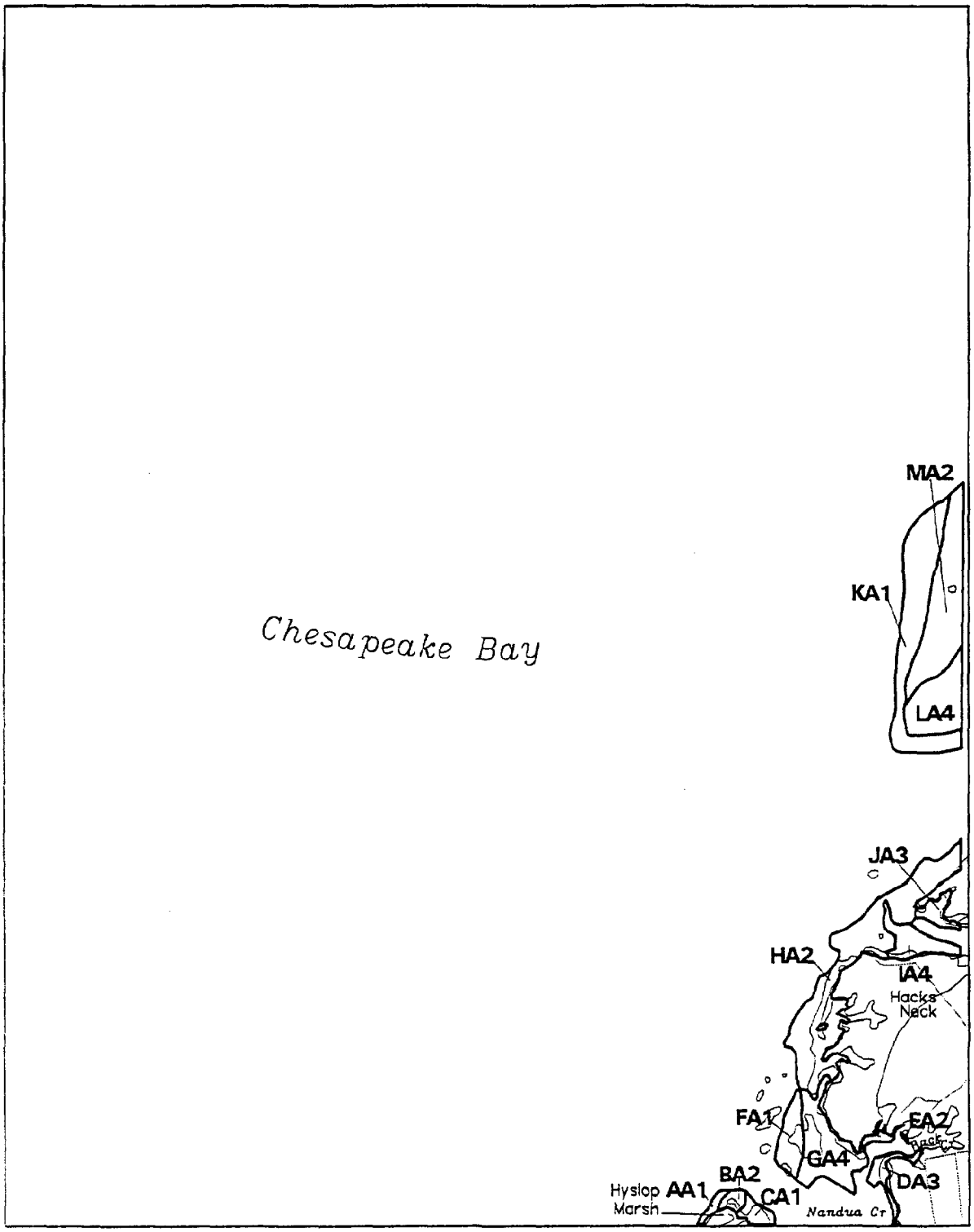
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-24-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Nandua Creek, Va.(113)



0 1000 2000 3000

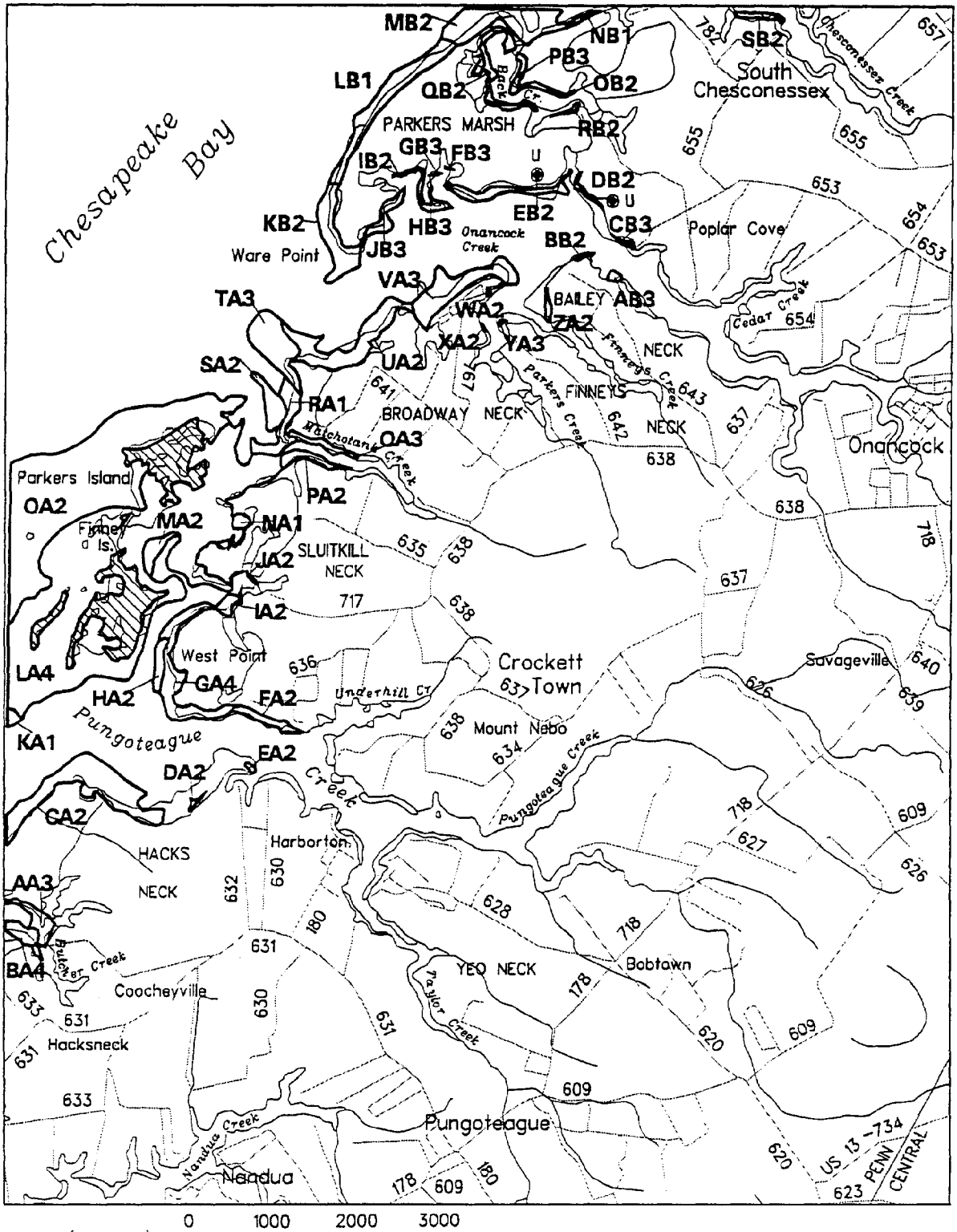
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-7-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Pungoteague, Va. (114)



0 1000 2000 3000

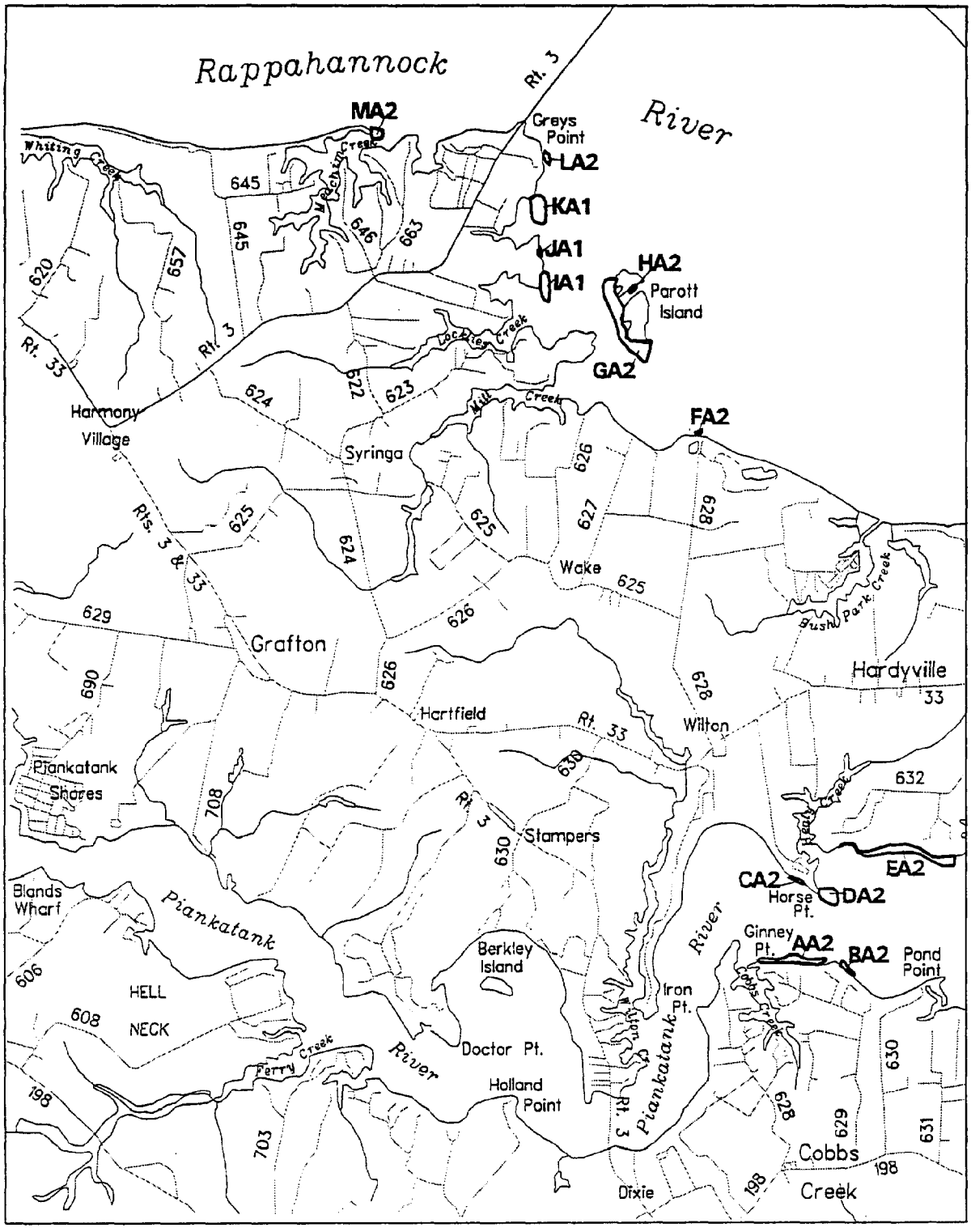
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-7-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Wilton, Va.(117)



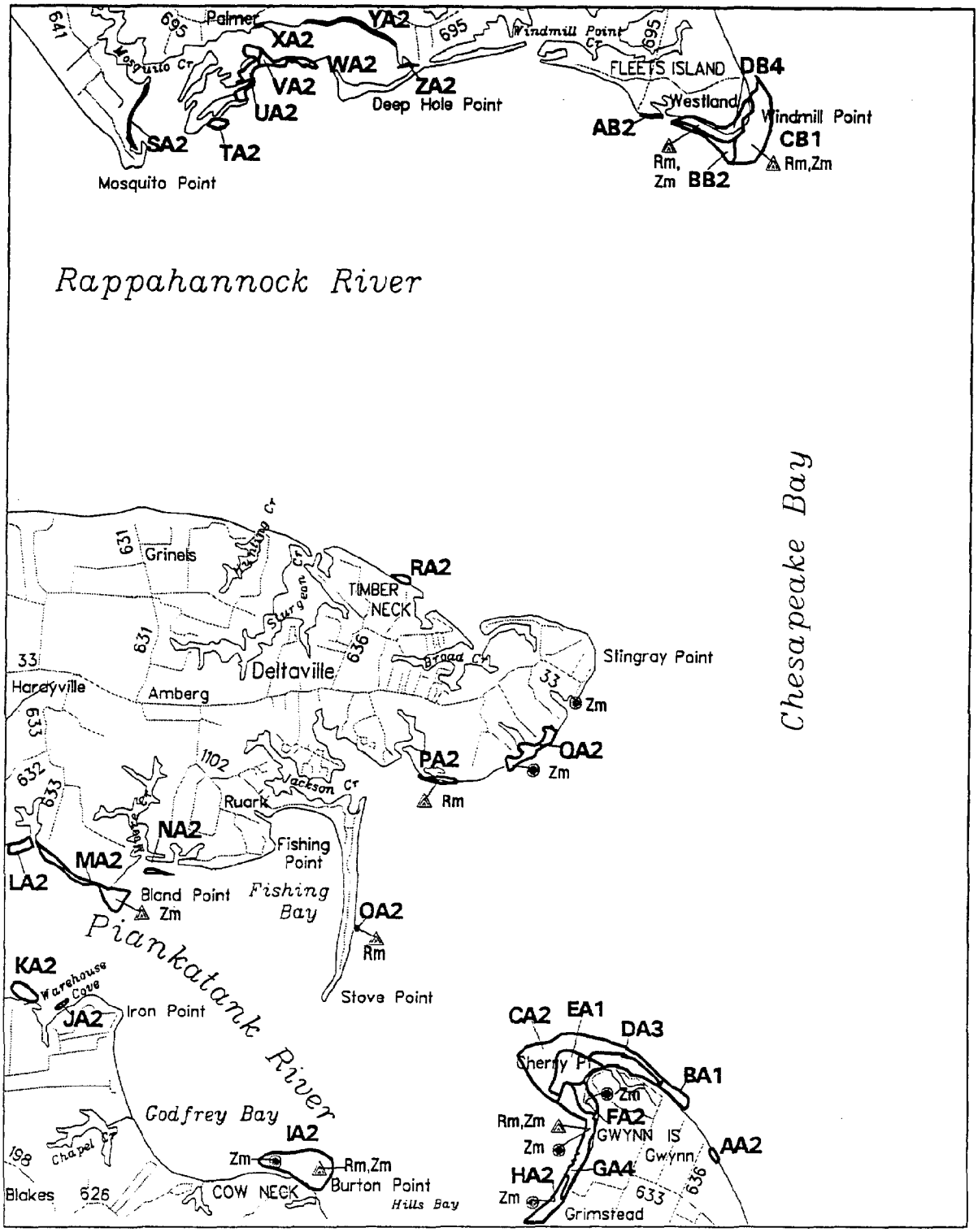
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Deltaville, Va. (118)



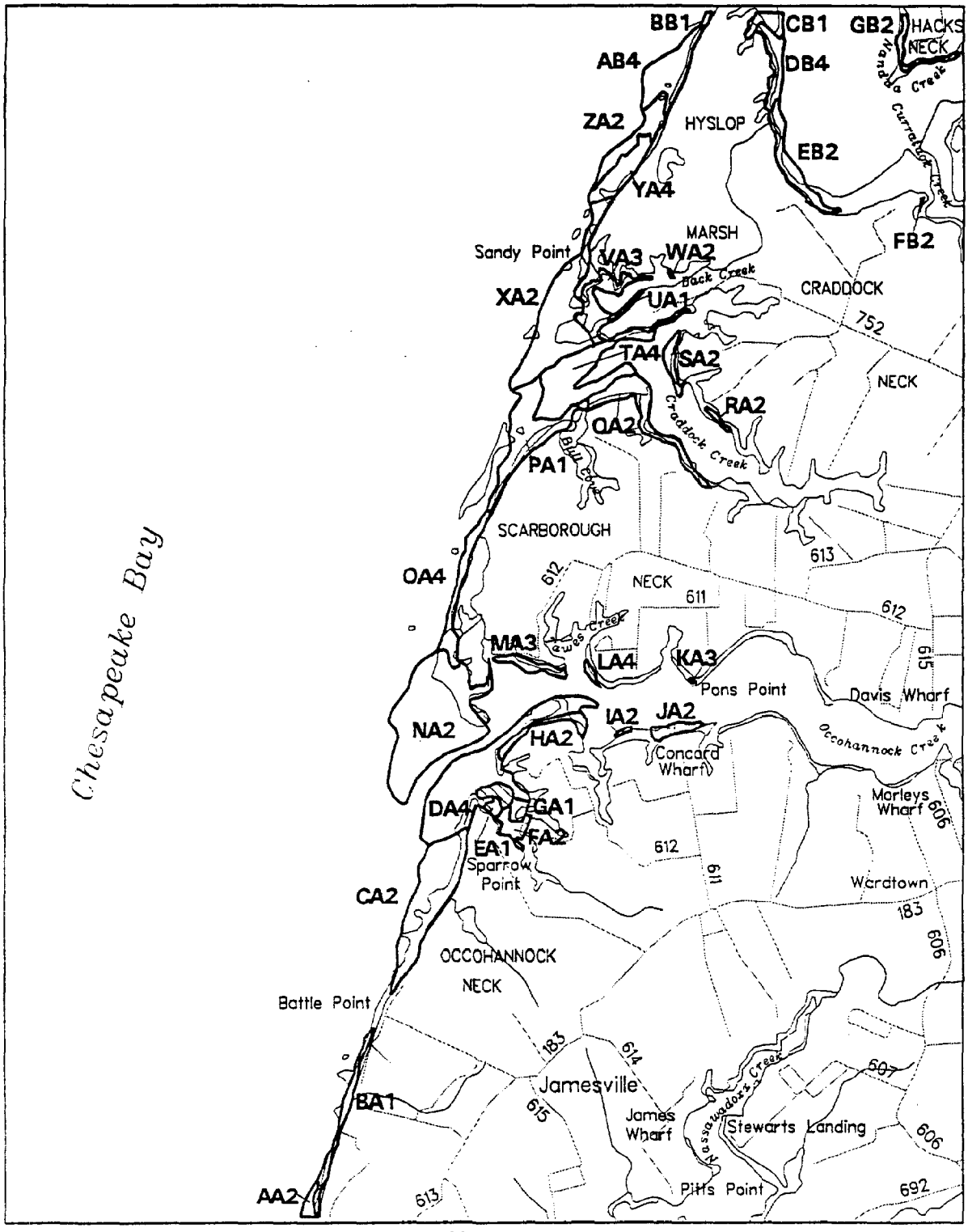
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Jamesville, Va.(119)



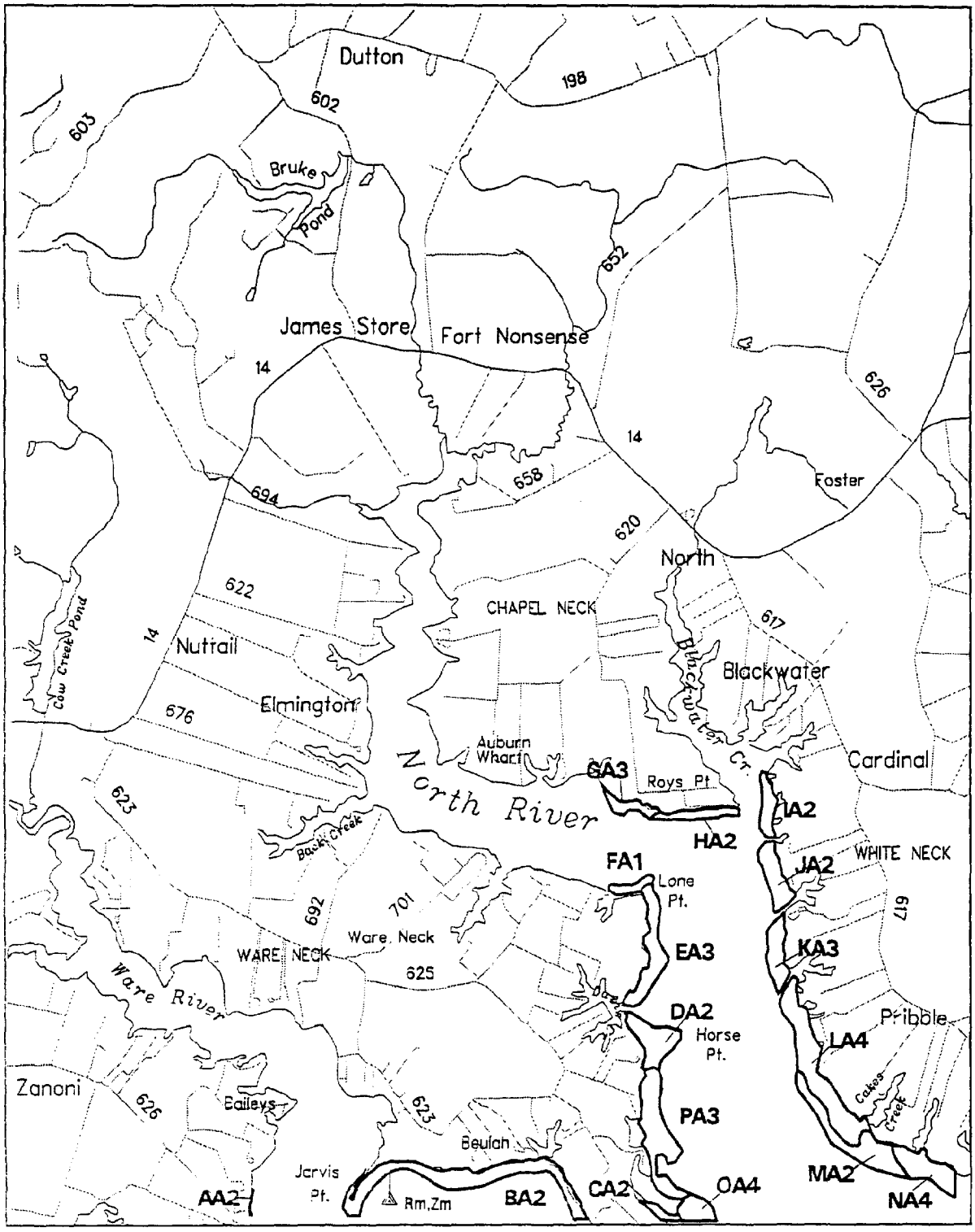
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Ware Neck, Va.(122)



0 1000 2000 3000

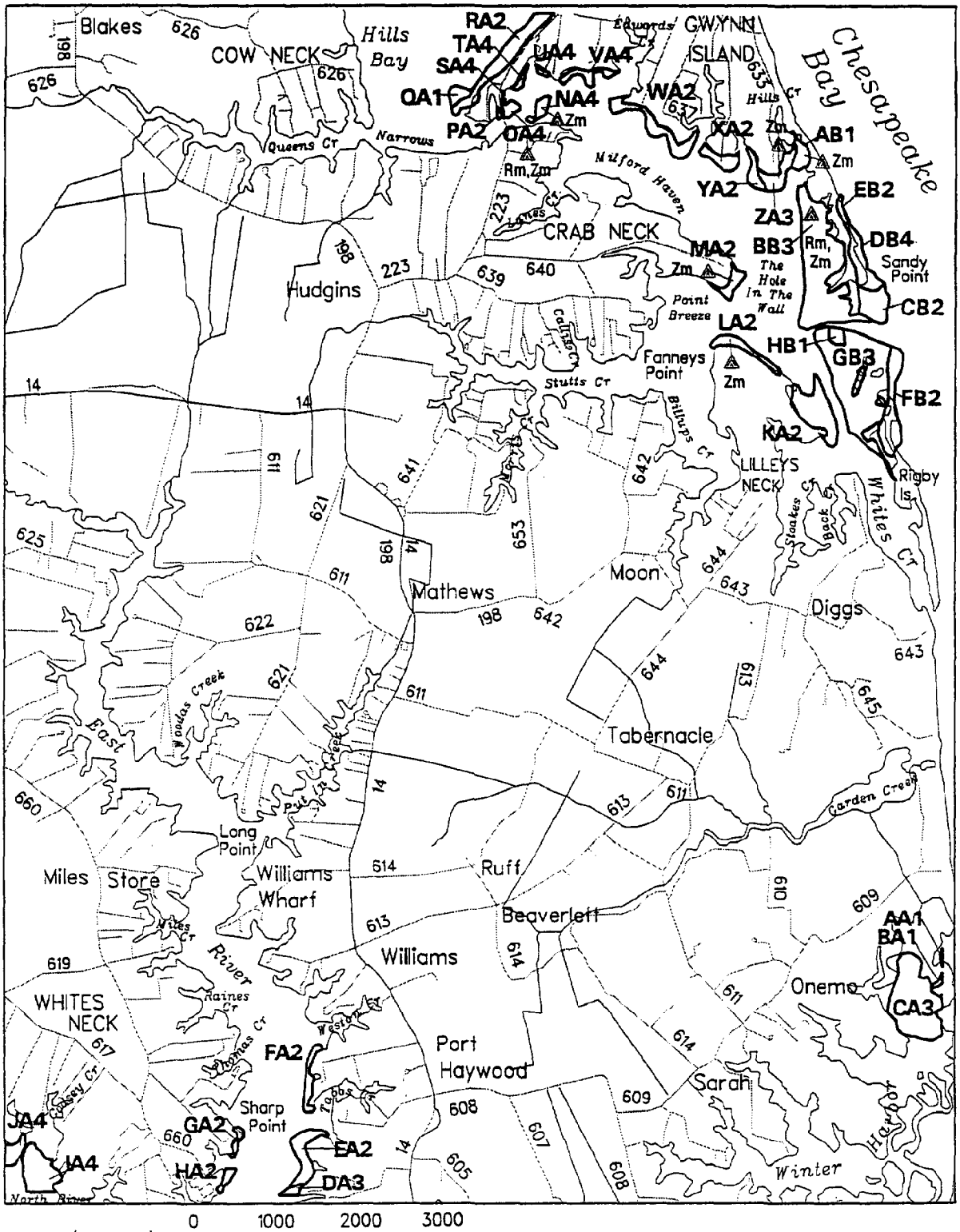
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-10-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Mathews, Va. (123)



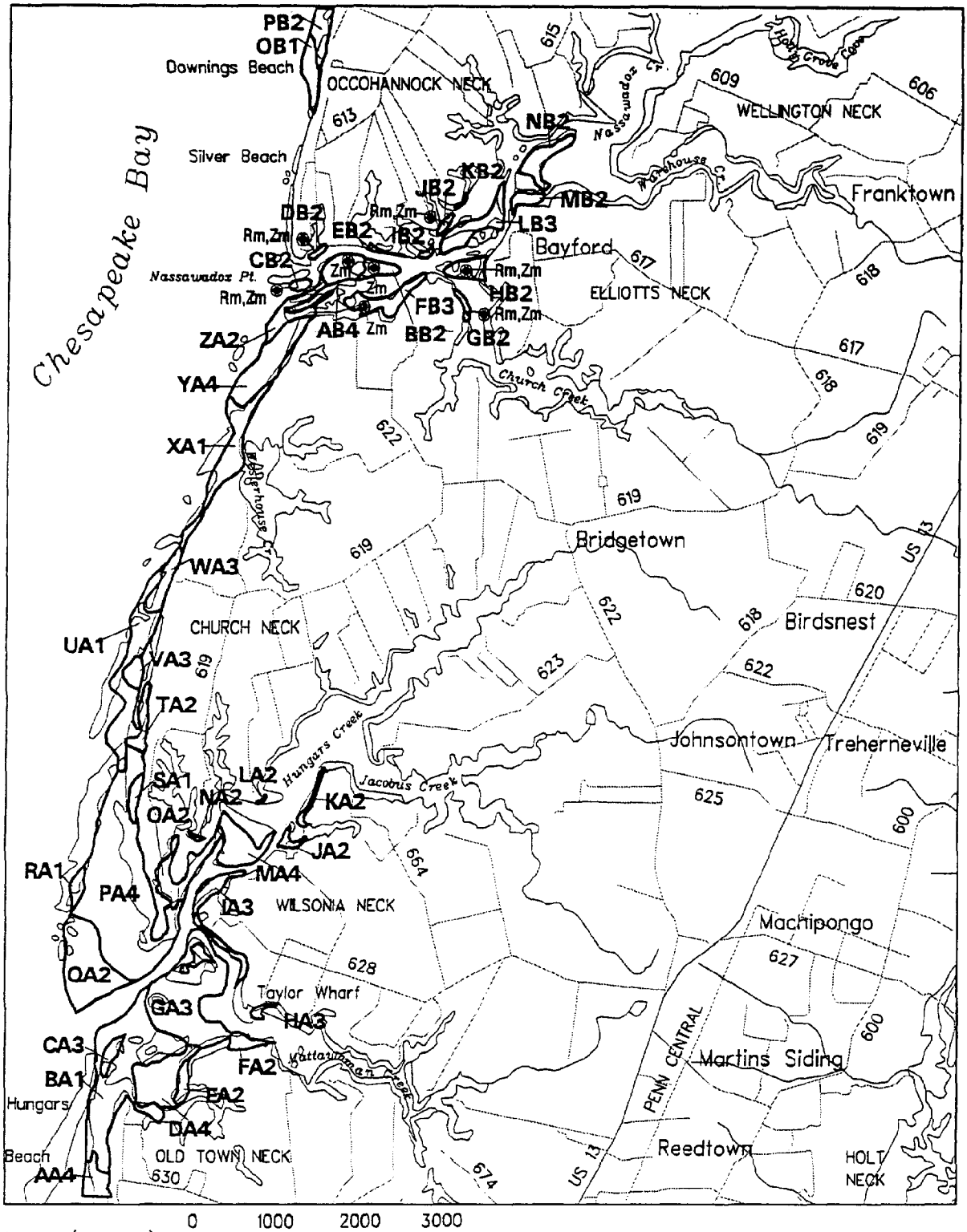
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Franktown, Va.(124)



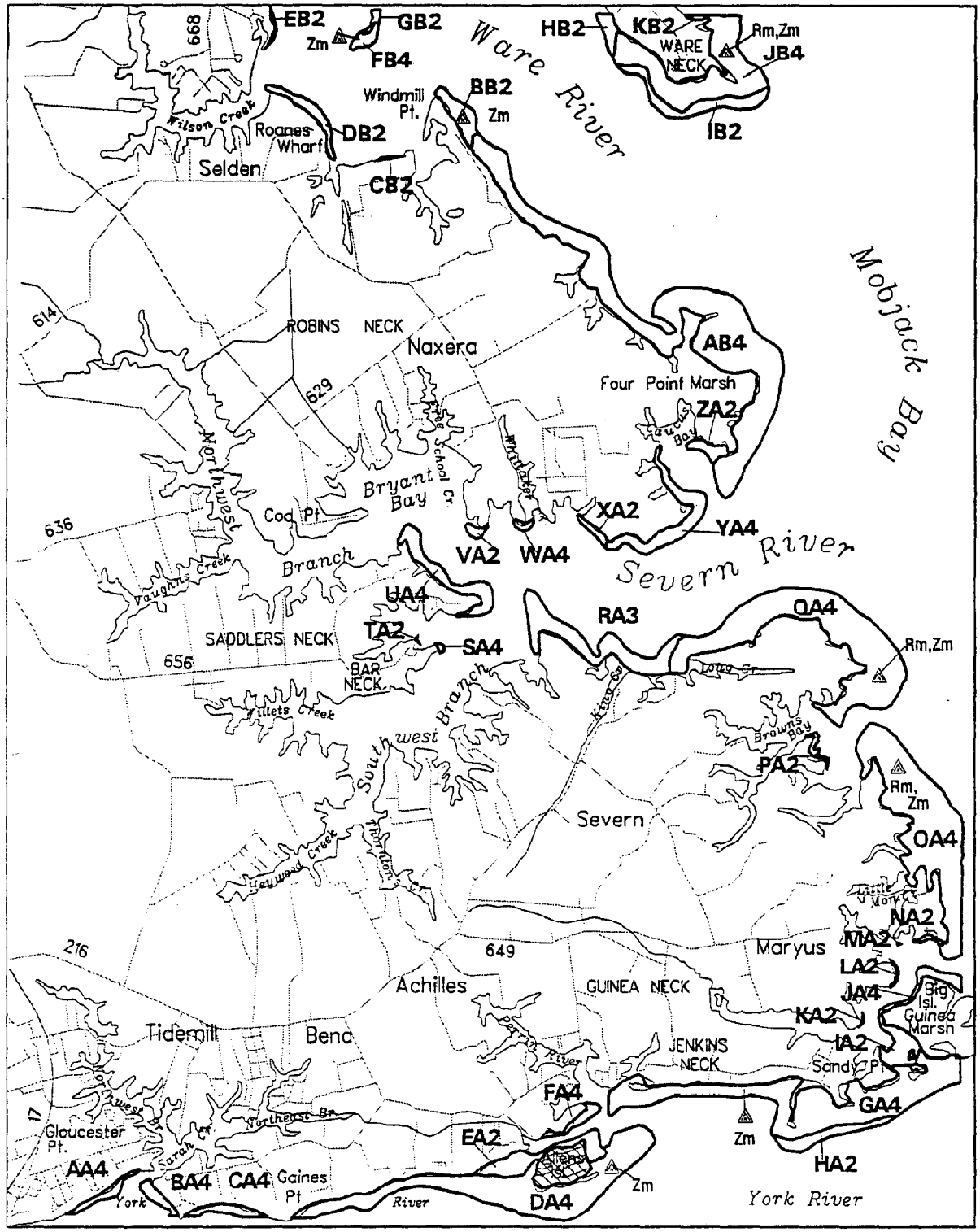
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Achilles, Va.(131)



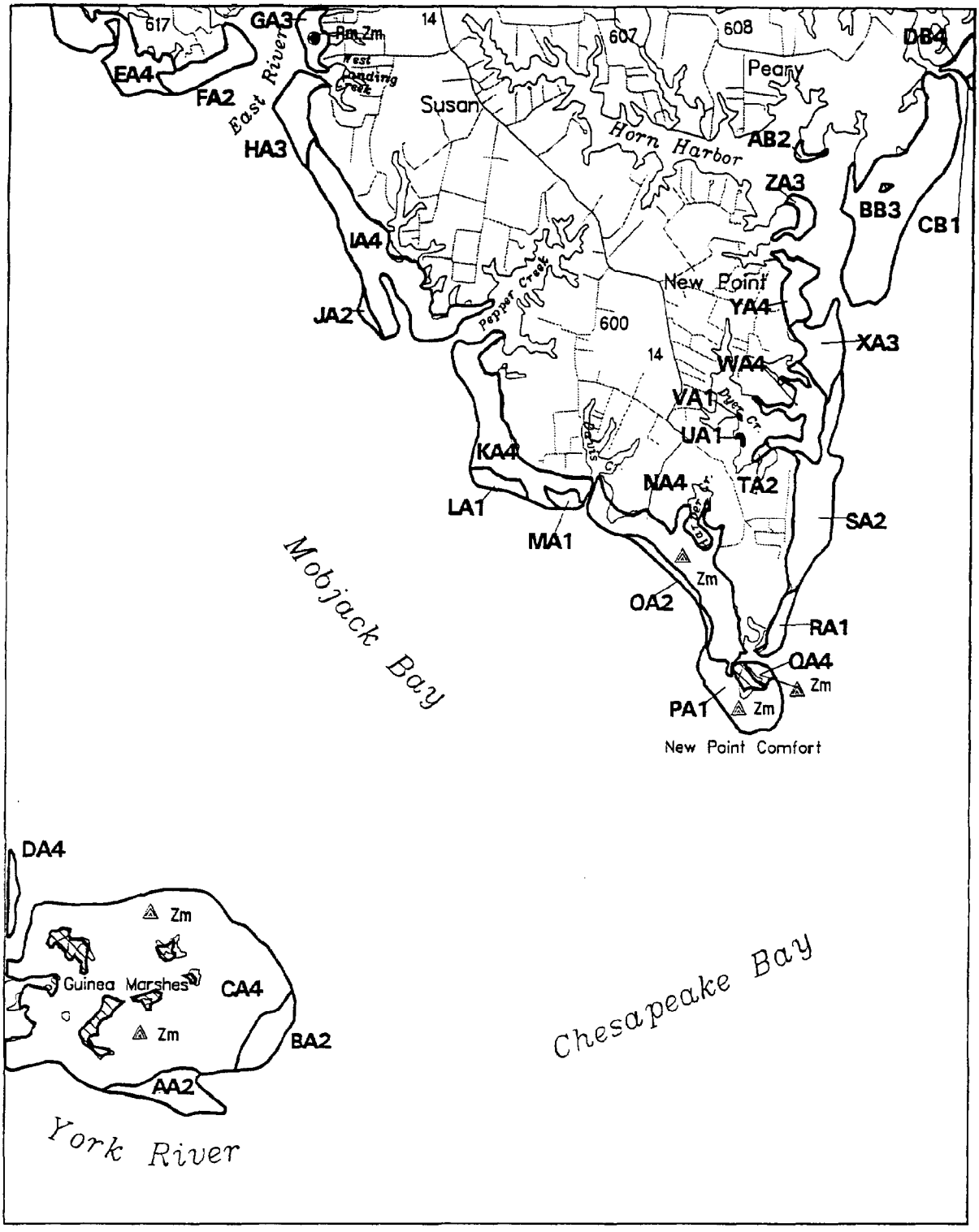
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-10-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
New Point Comfort, Va.(132)



0 1000 2000 3000

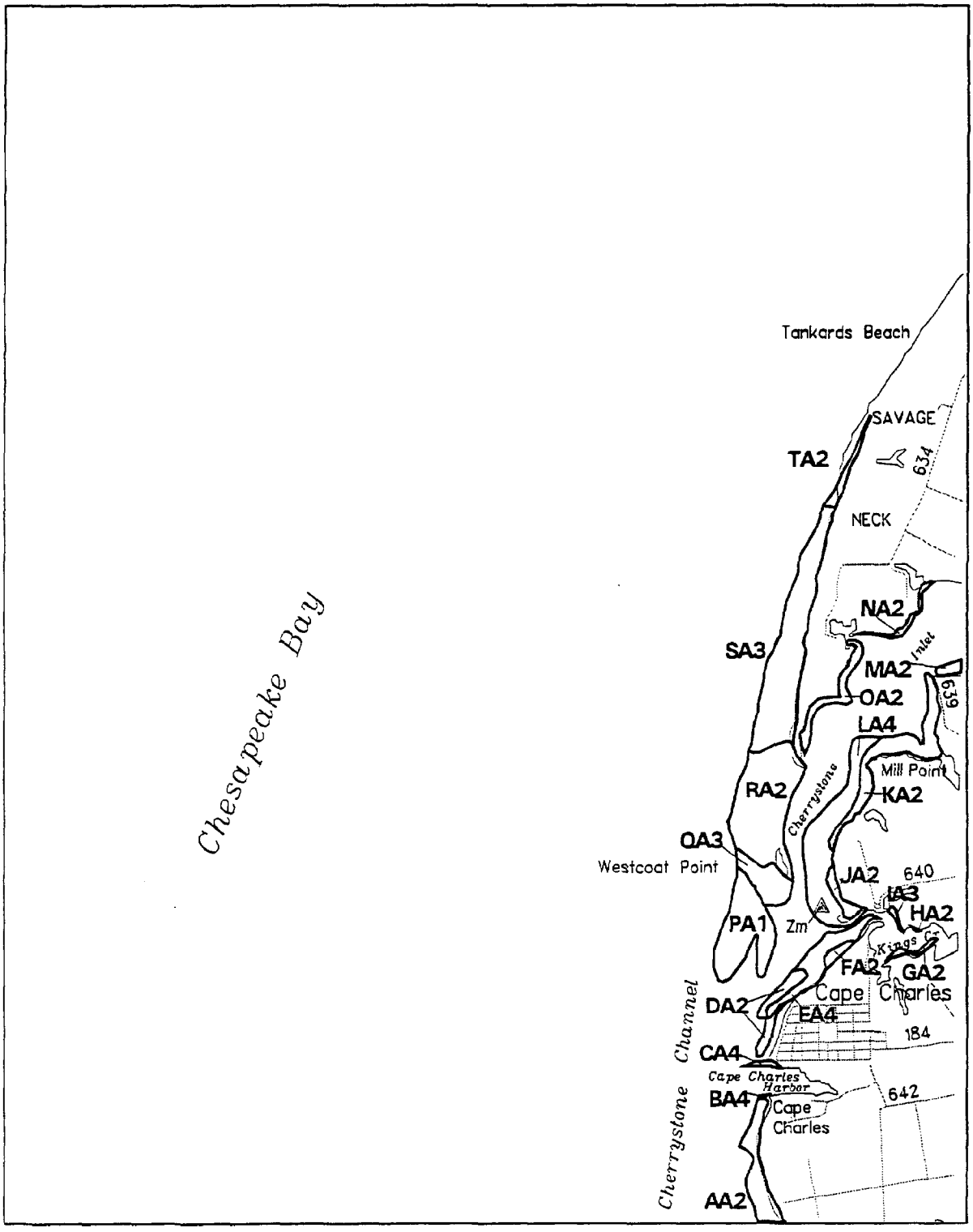
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Cape Charles, Va.(133)



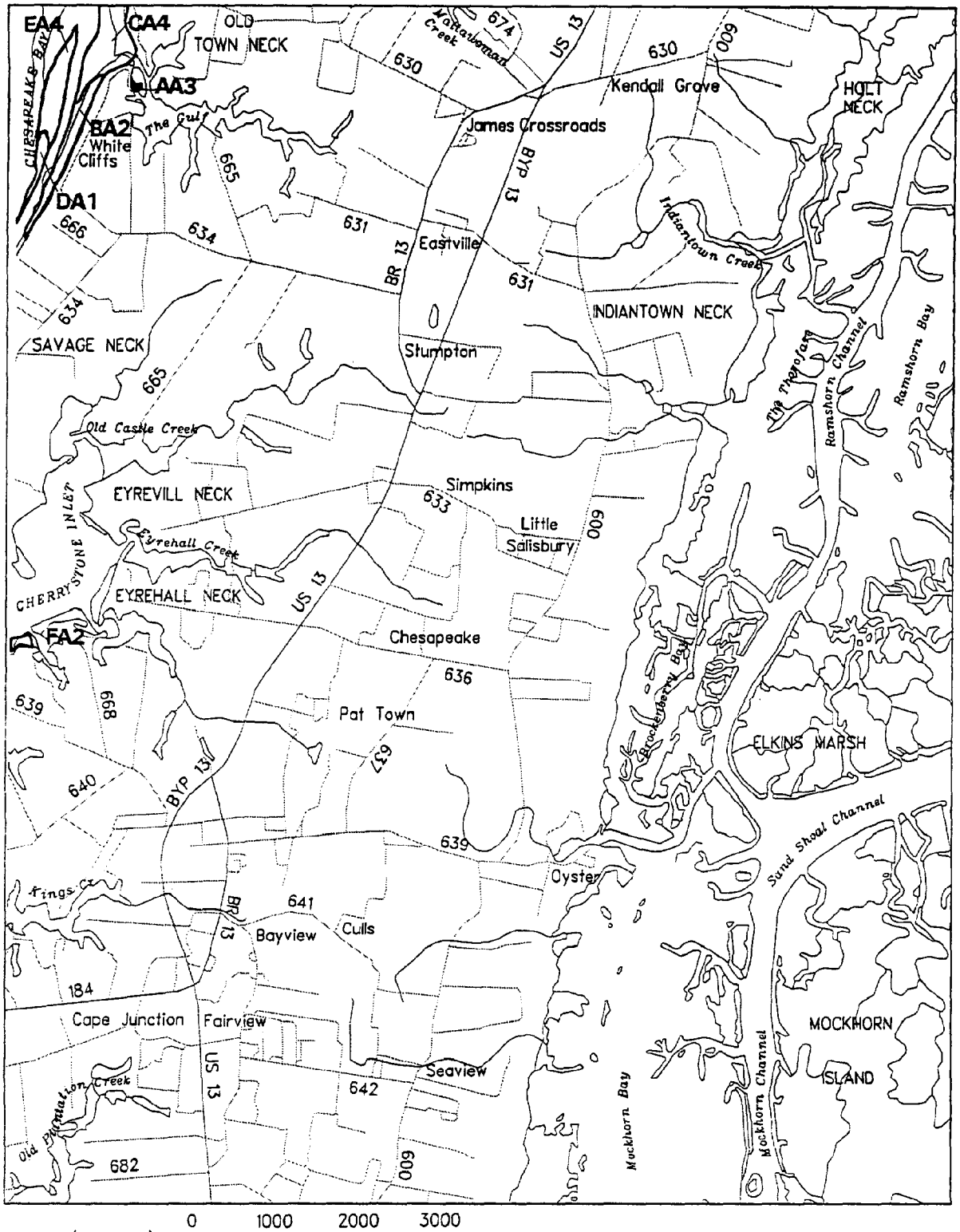
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Cheriton, Va.(134)



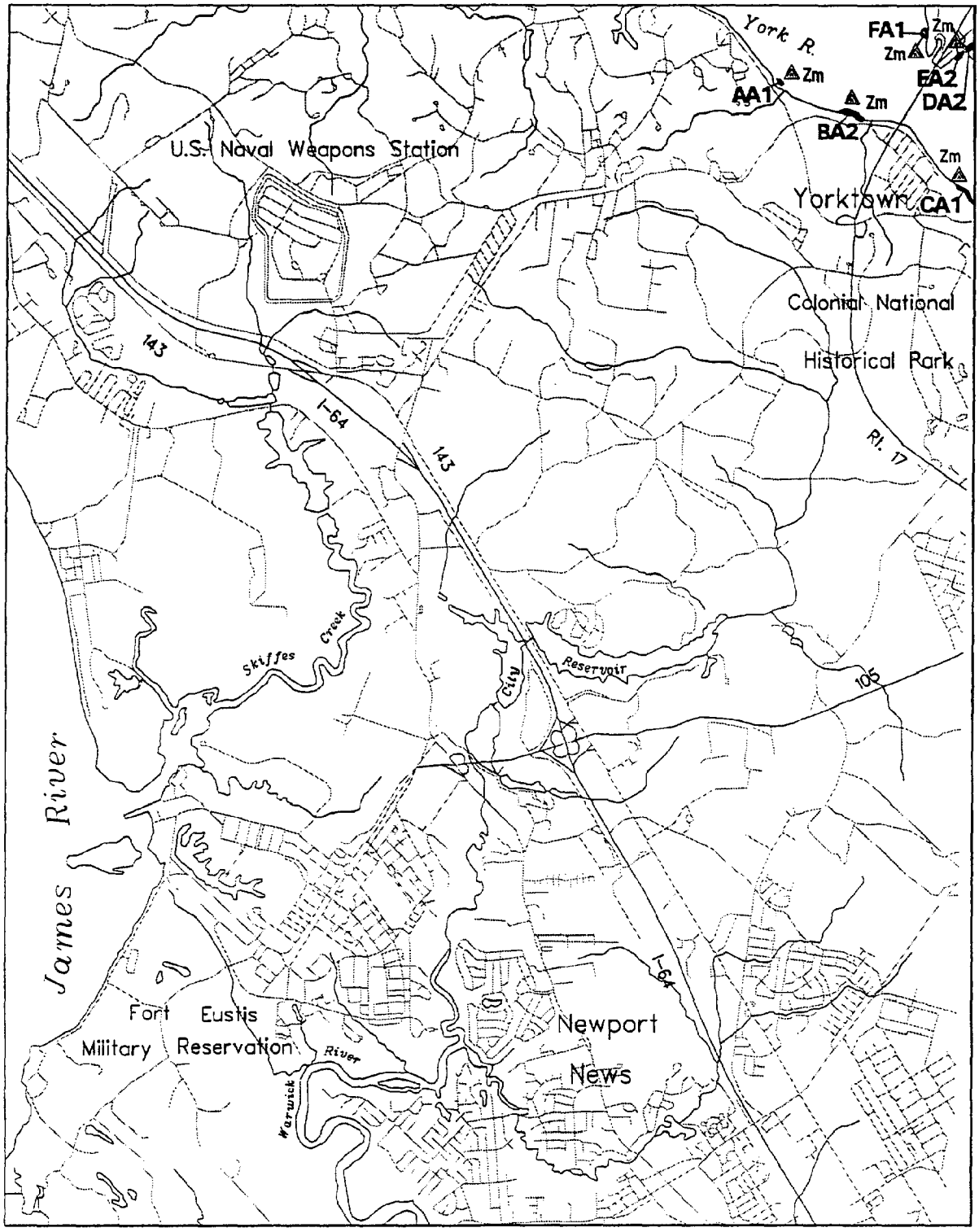
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Yorktown, Va.(139)



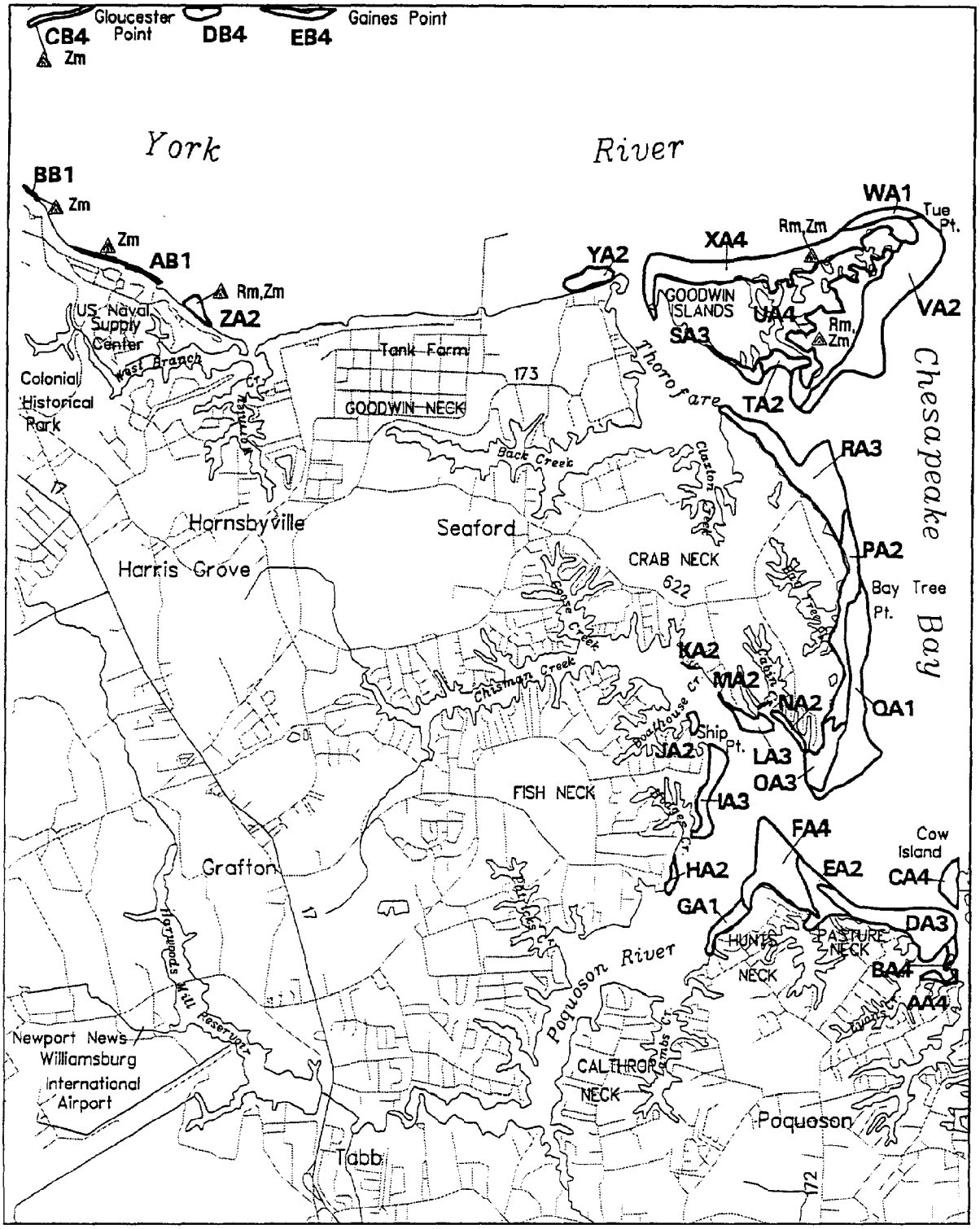
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-10-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Poquoson West, Va.(140)



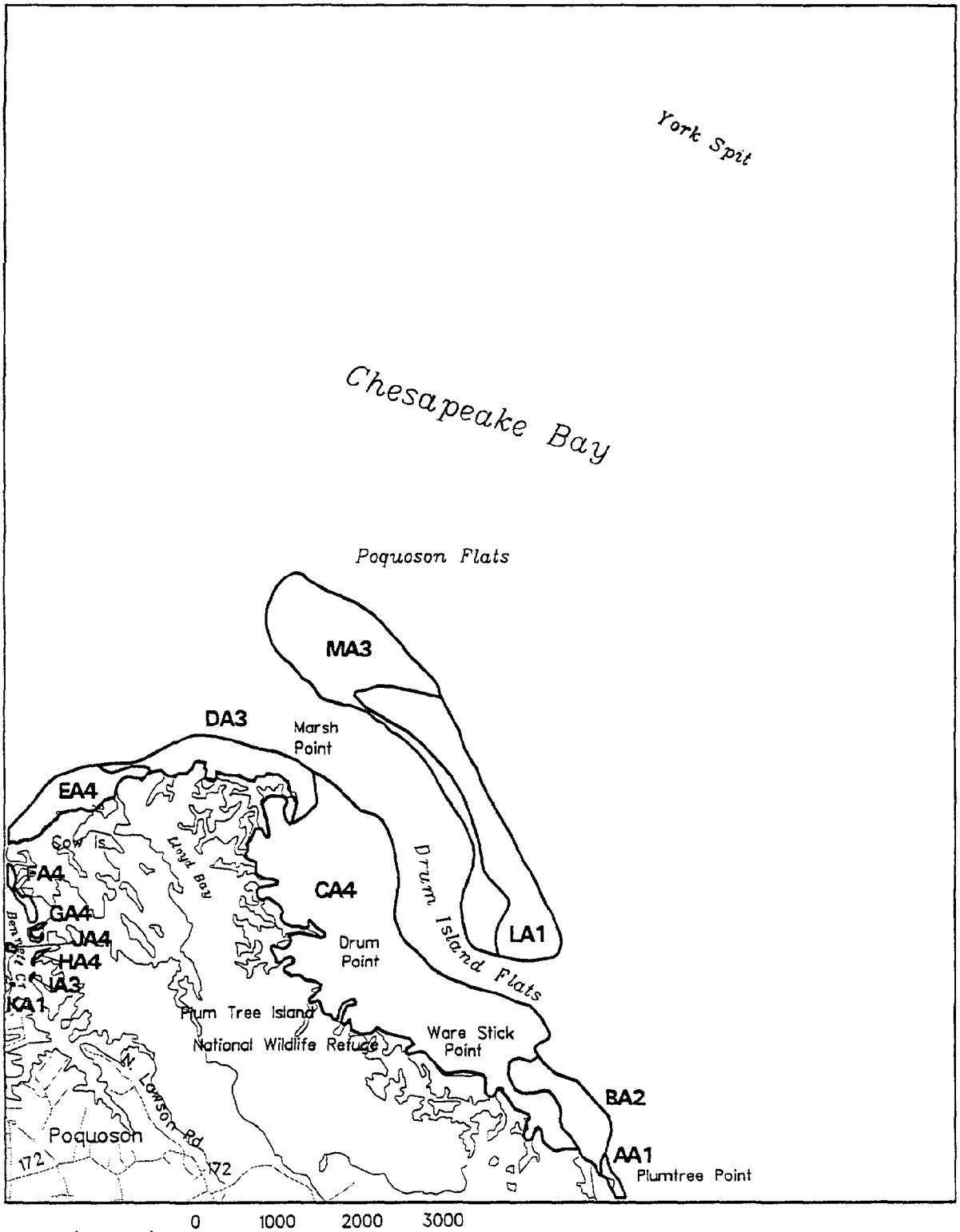
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-10-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Poquoson East, Va.(141)



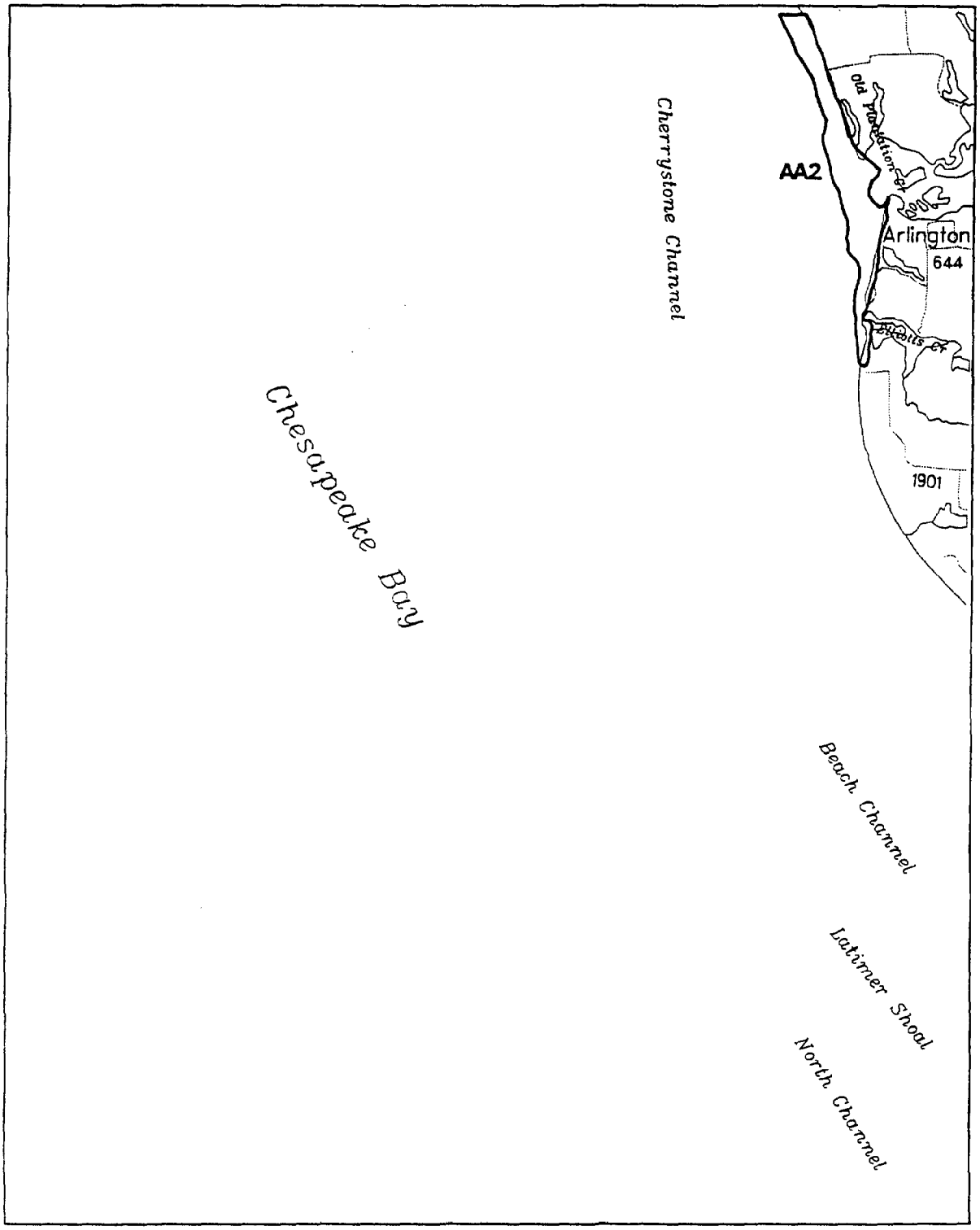
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-10-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Elliotts Creek, Va.(142)



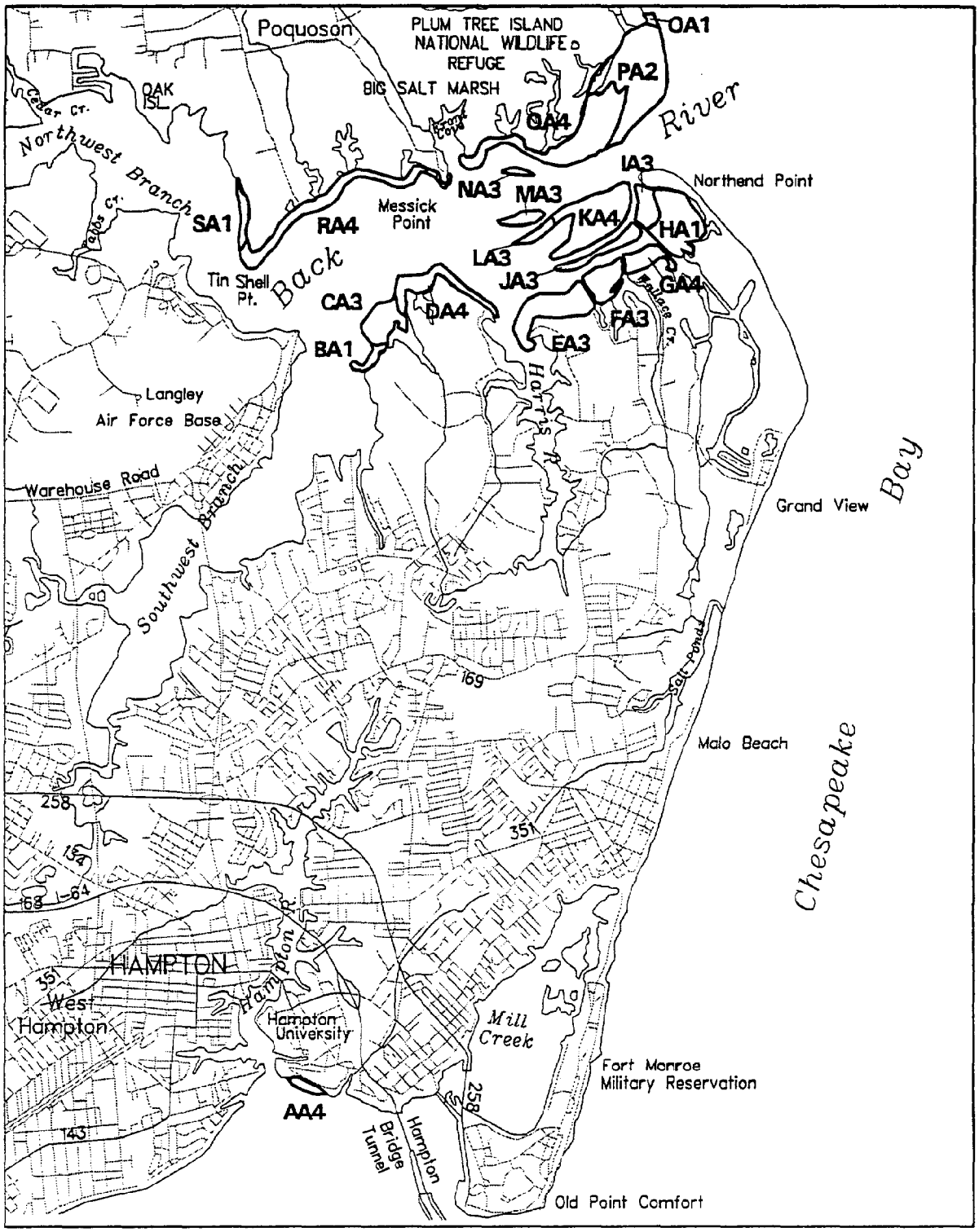
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Hampton, Va.(147)



0 1000 2000 3000

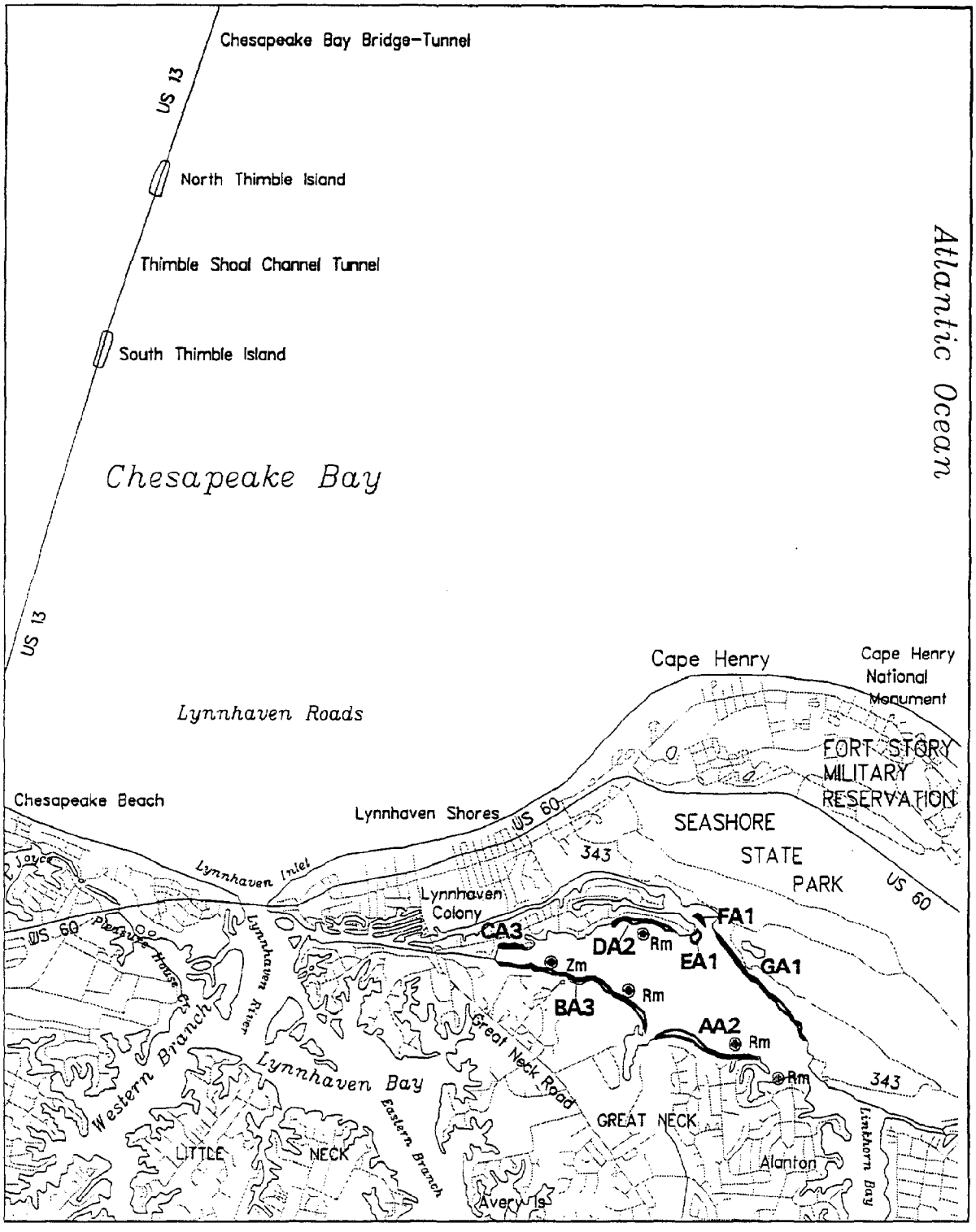
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-10-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Cape Henry, Va.(152)



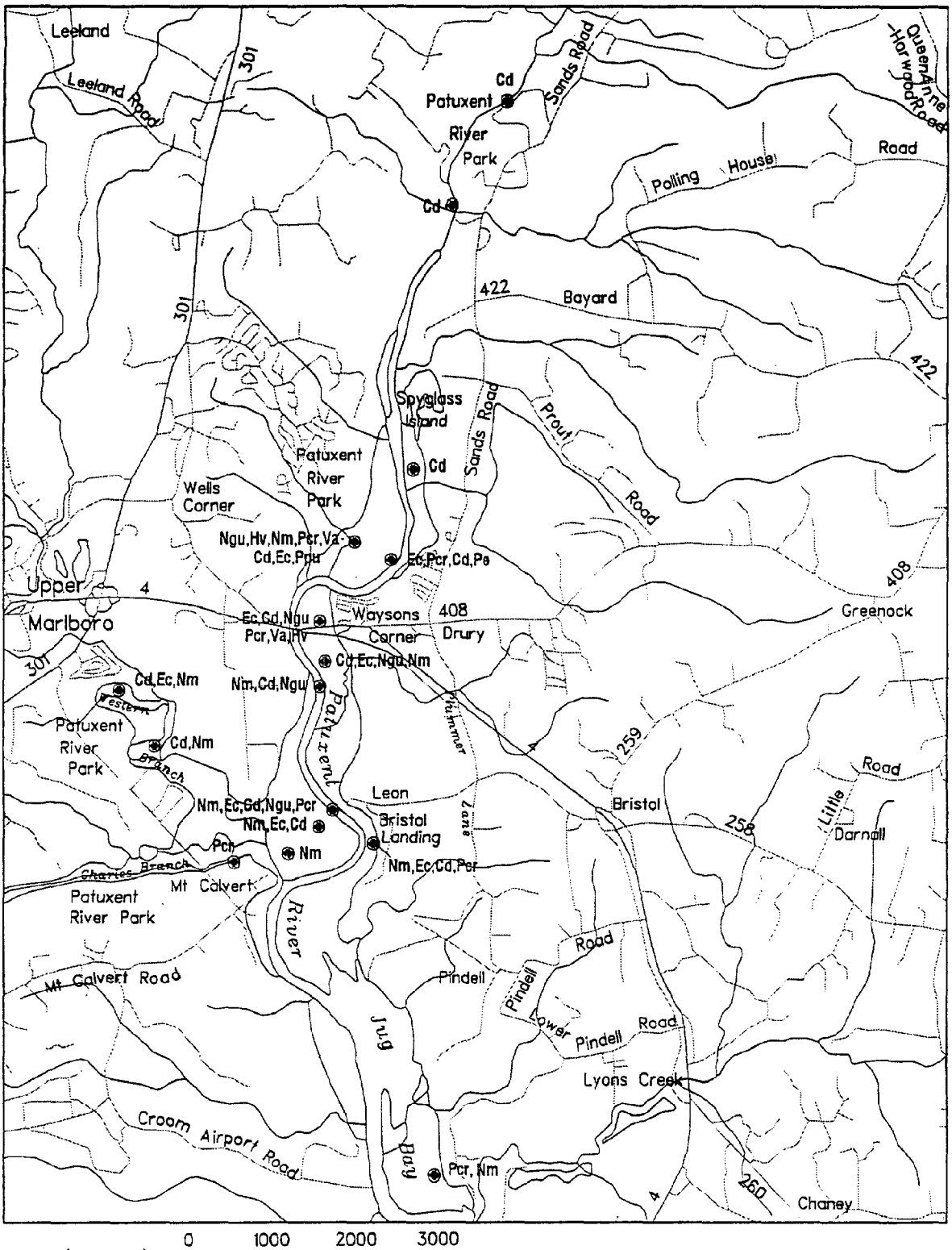
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-10-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Bristol, Md.(159)



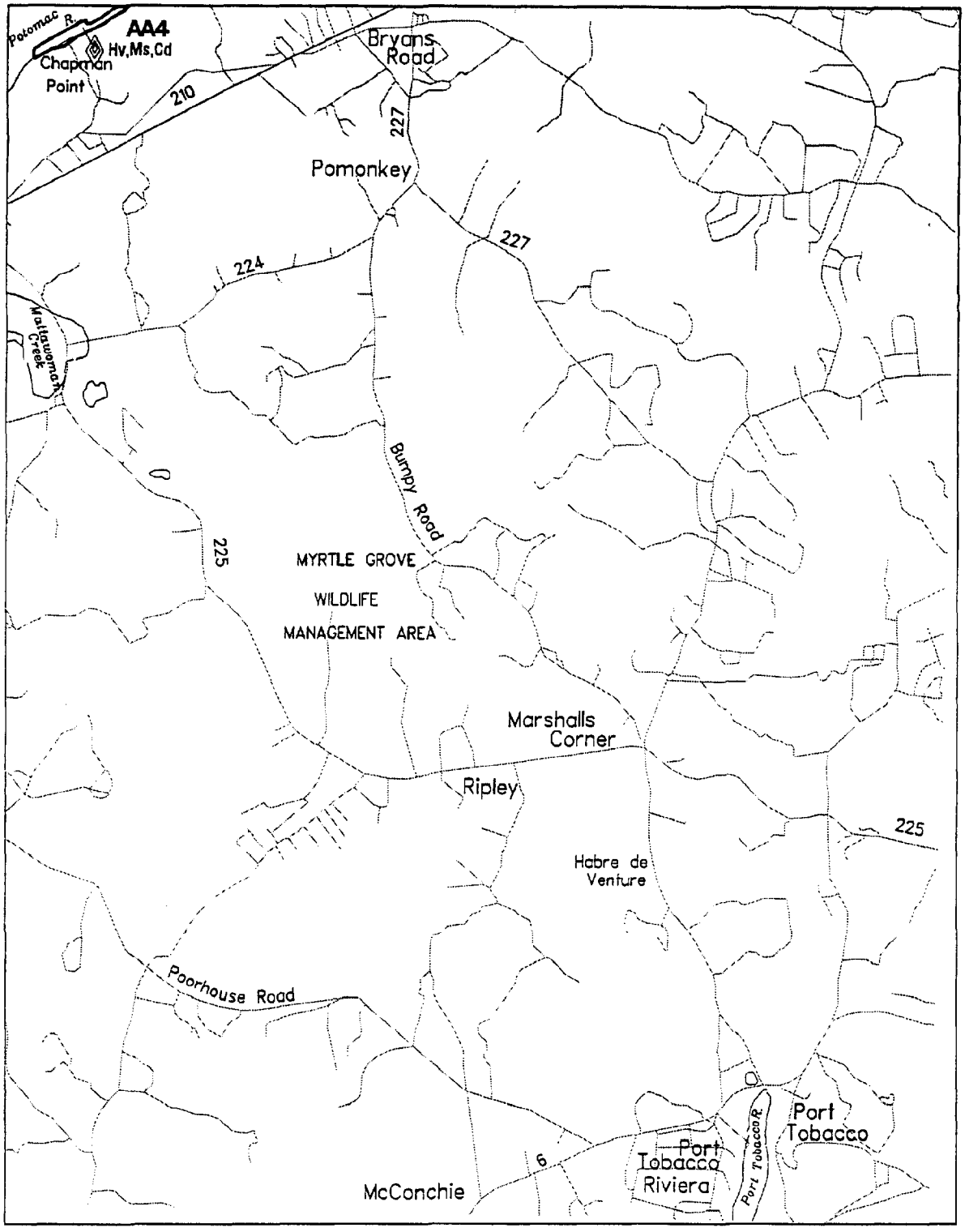
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-16-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Port Tobacco, Md.(161)



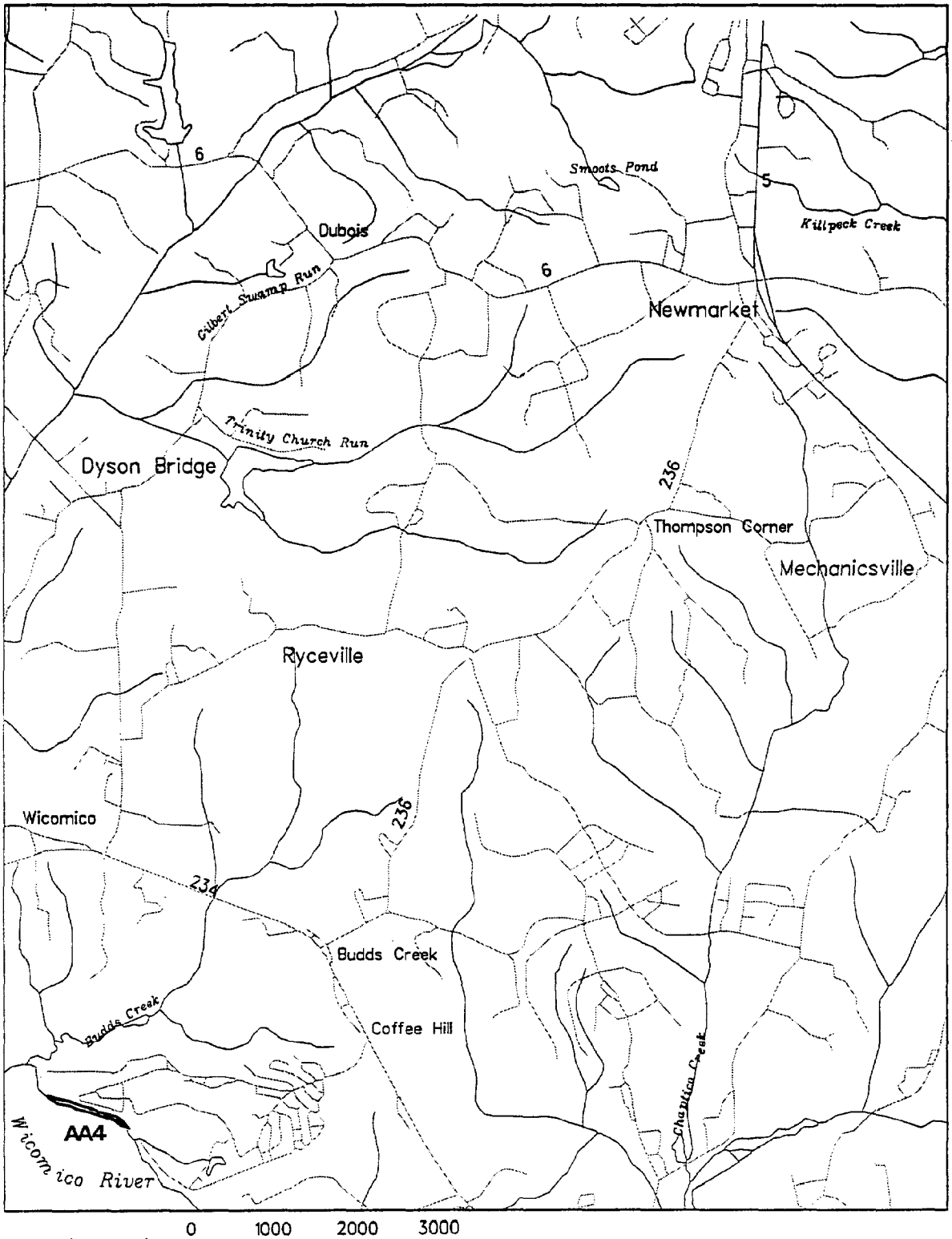
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 9-14-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Charlotte Hall, Md.(162)



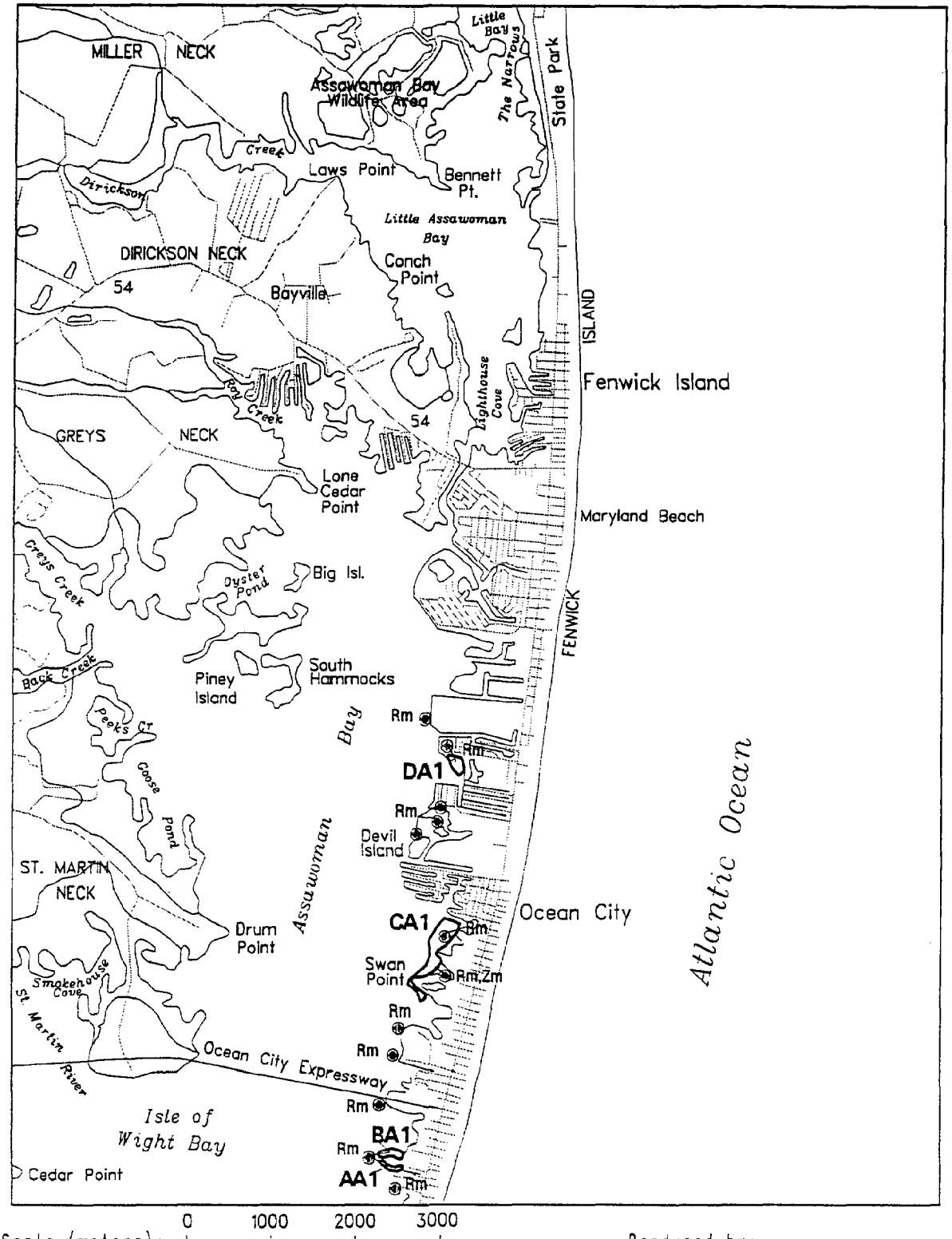
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 7-16-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Assawoman Bay, Md.(166)



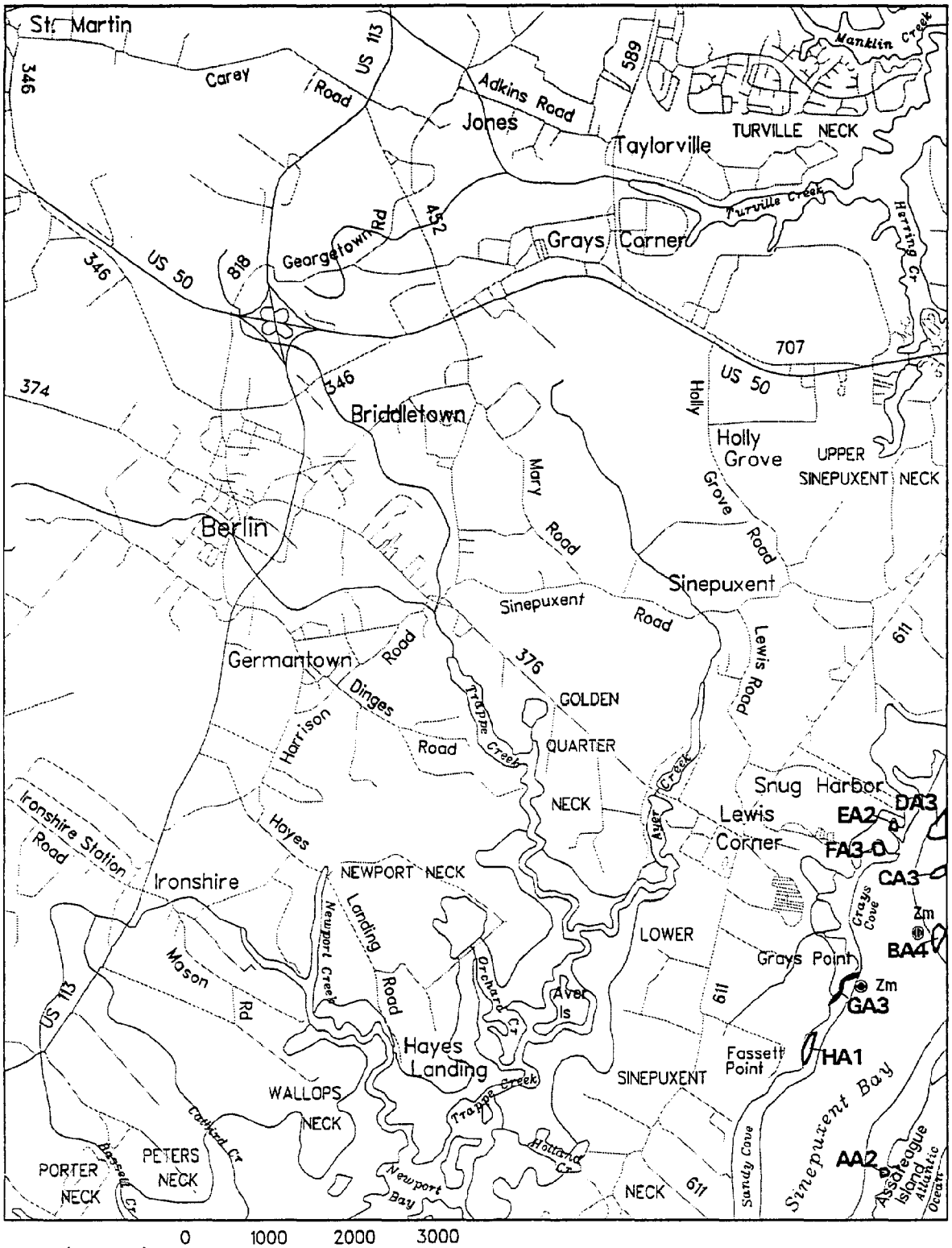
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Berlin, Md.(167)



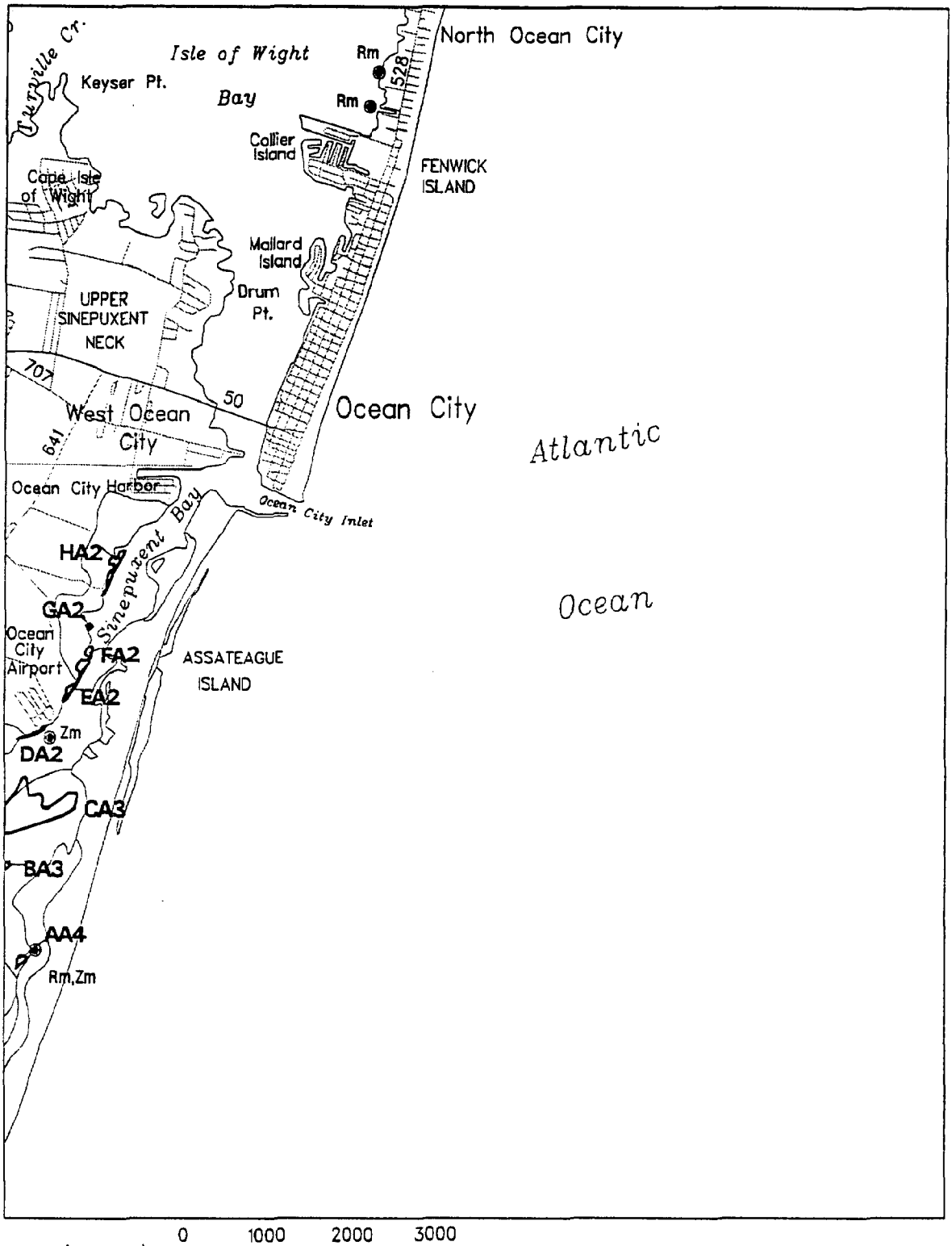
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Ocean City, Md.(168)



0 1000 2000 3000

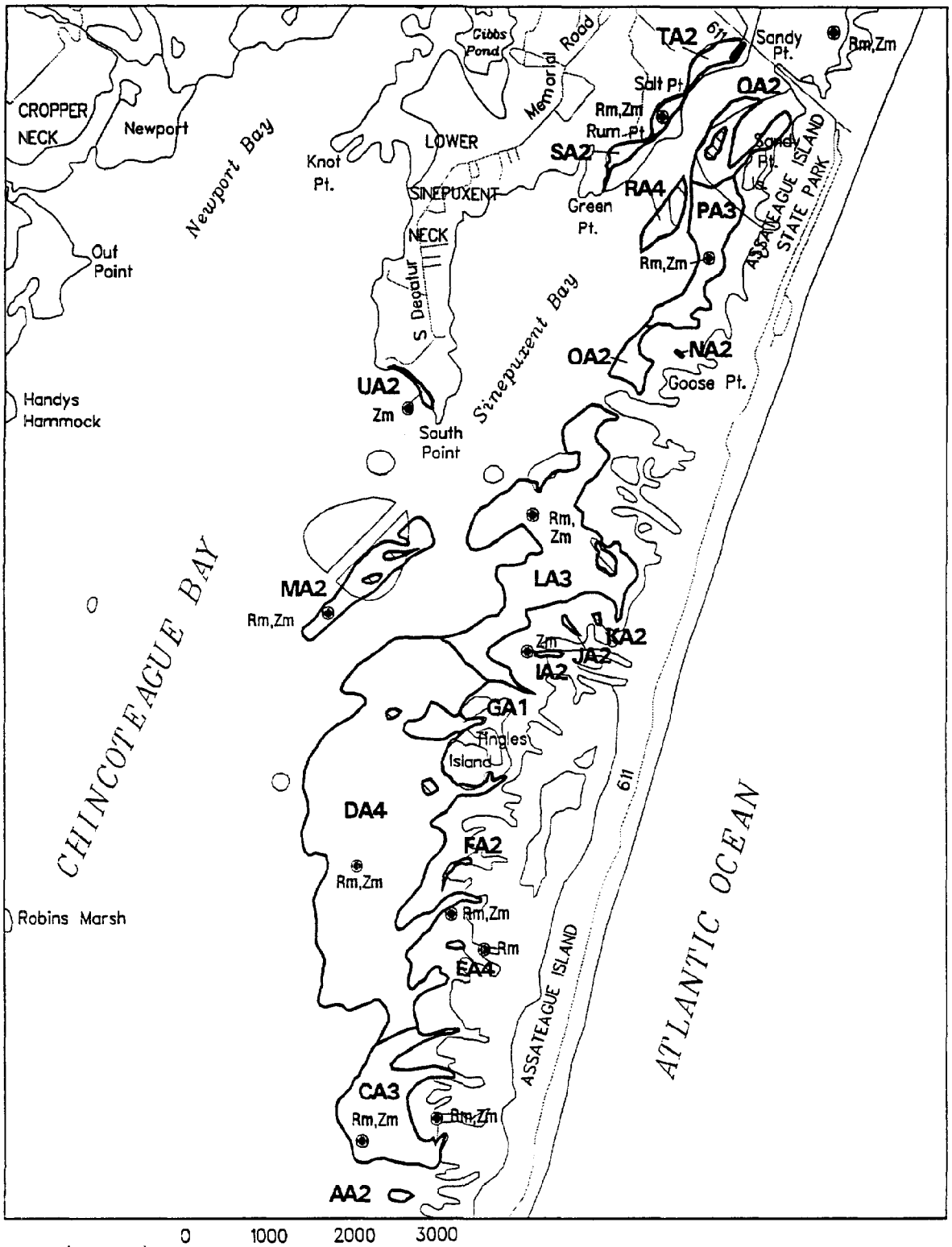
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Tingles Island, Md. (170)



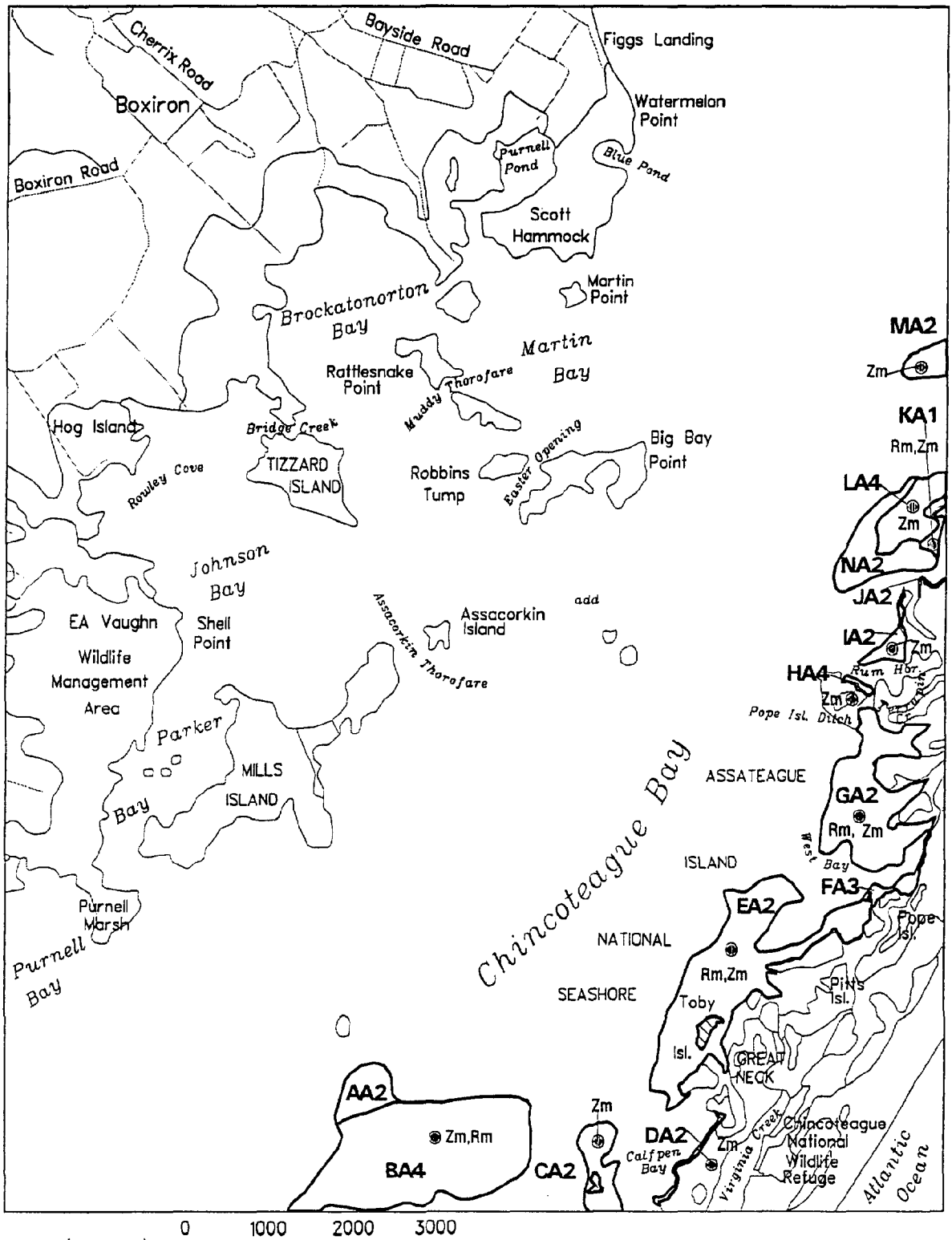
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Boxiron, Md.-Va.(172)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
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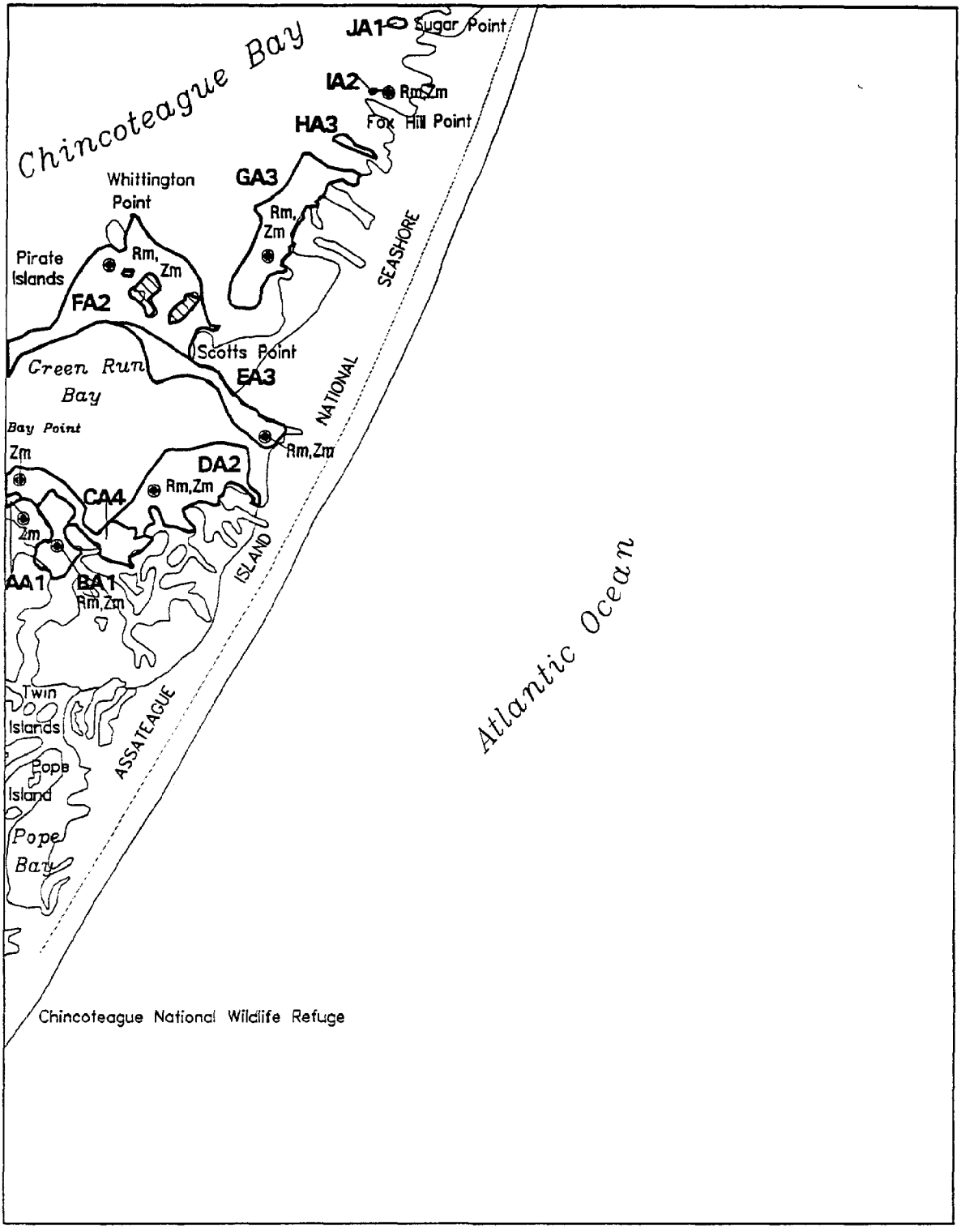
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Whittington Point, Md.-Va.(173)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
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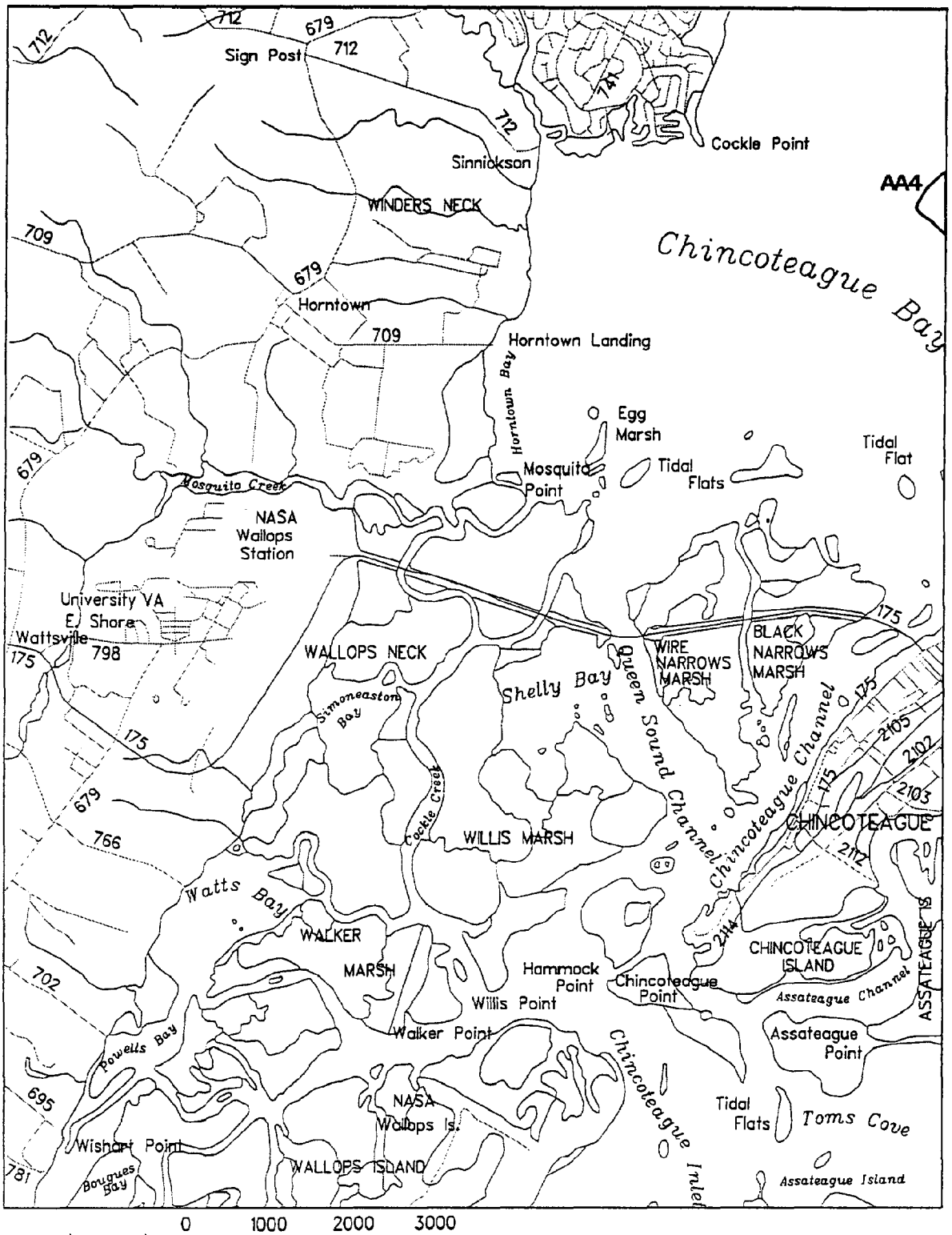
SUBMERGED AQUATIC VEGETATION 1993
Chincoteague West, Va.(174)



0 1000 2000 3000

Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
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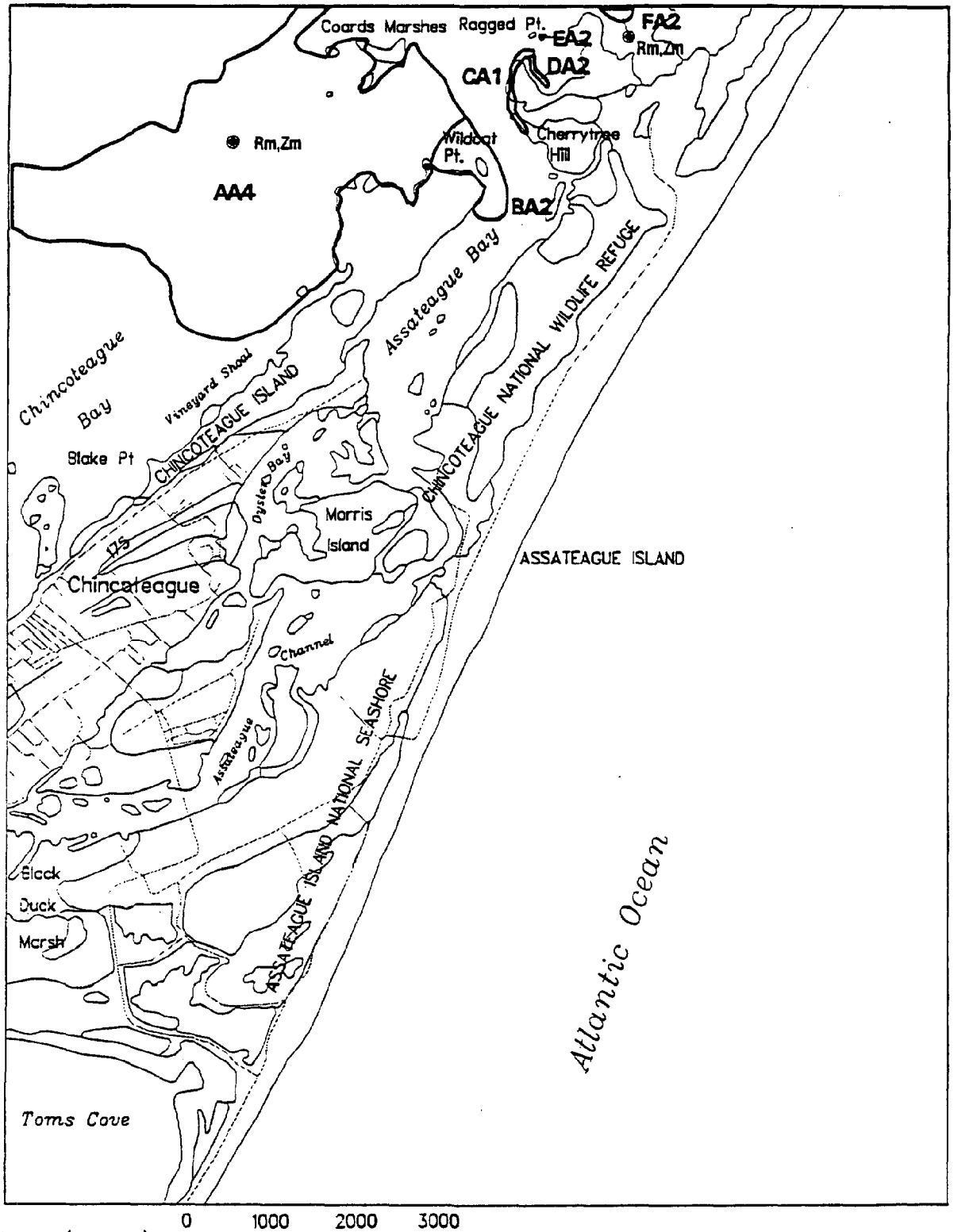
SUBMERGED AQUATIC VEGETATION 1993
Chincoteague East, Va.(175)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
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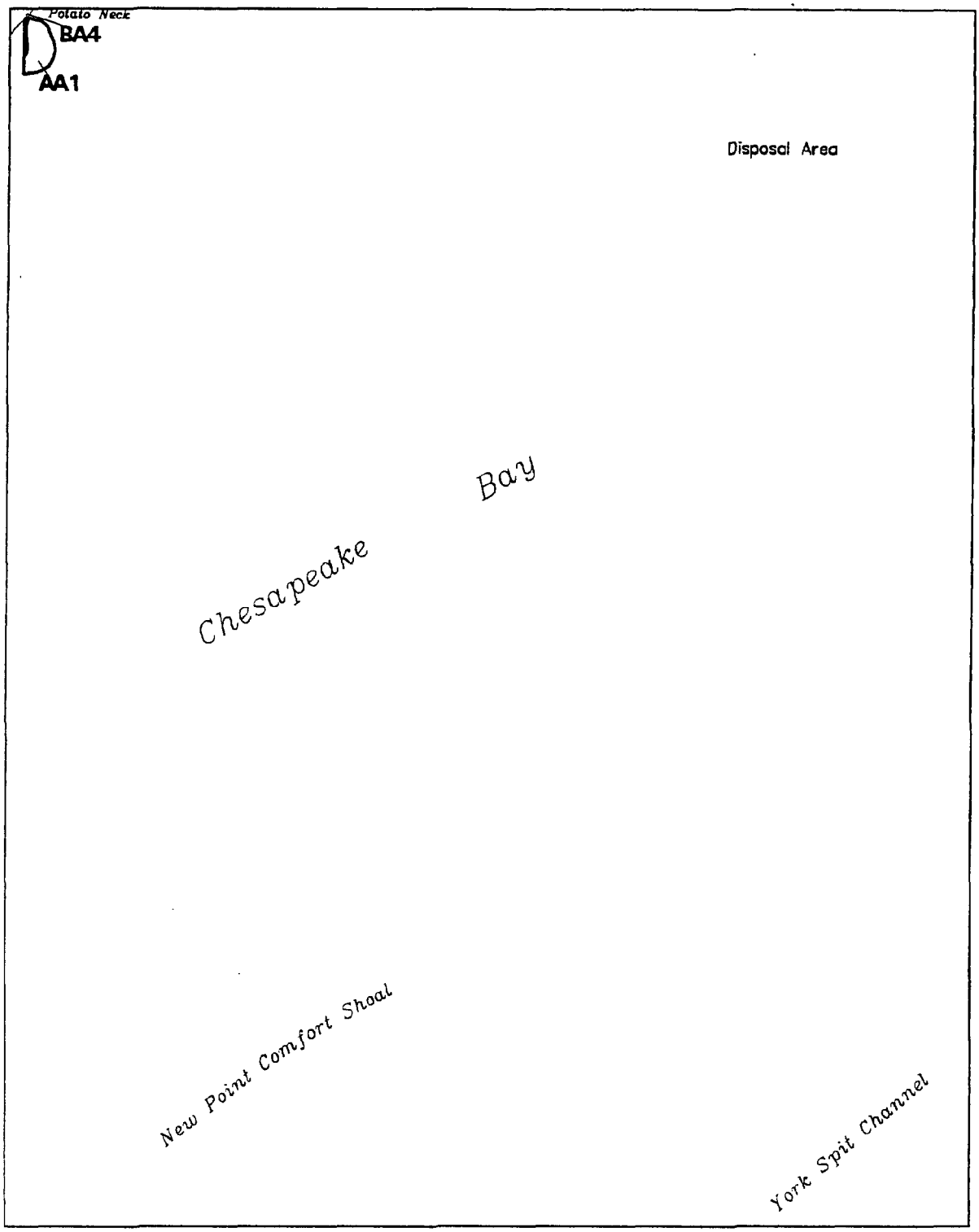
SUBMERGED AQUATIC VEGETATION 1993
East of New Point Comfort, Va.(177)



0 1000 2000 3000

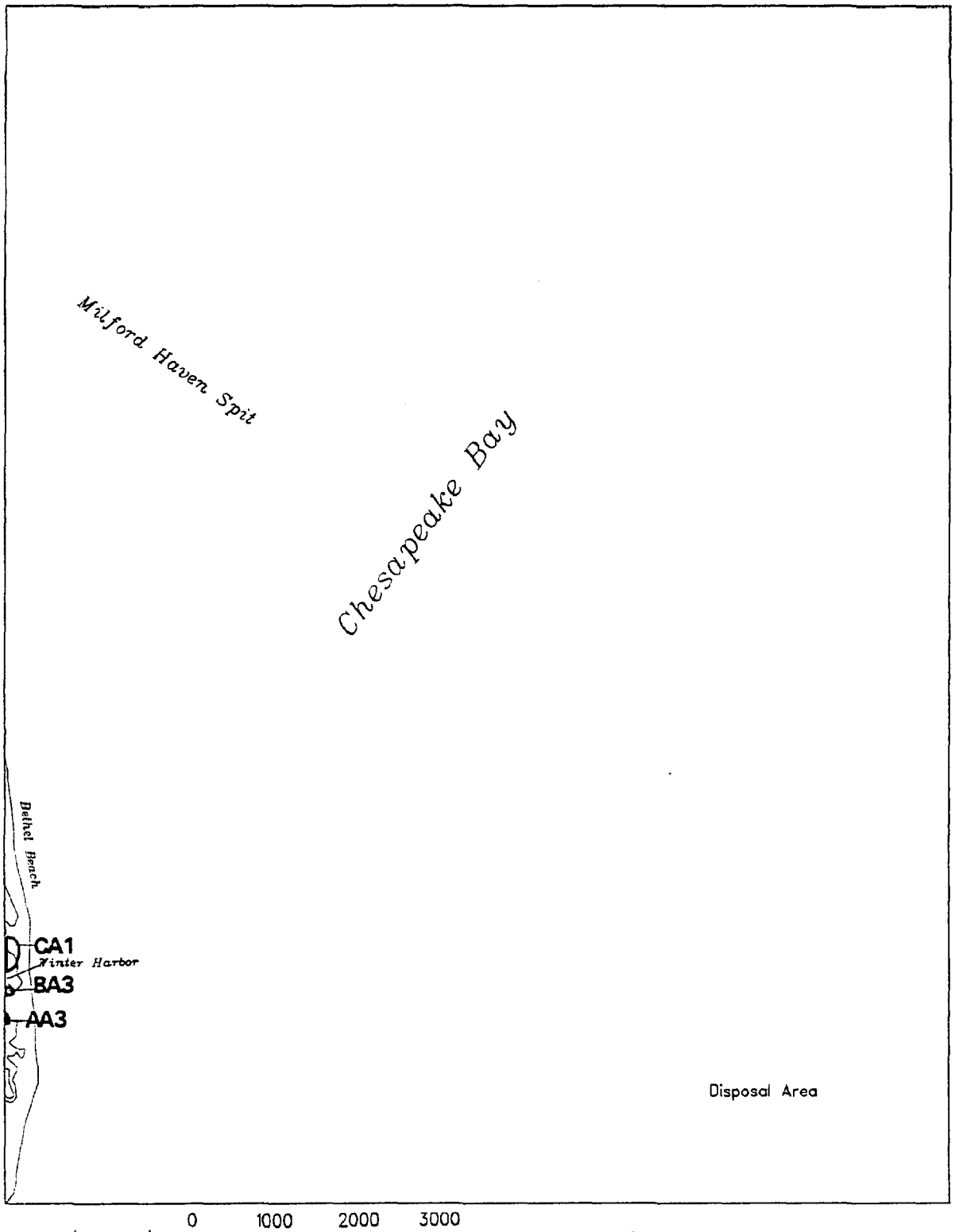
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-23-93

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1993
Bethel Beach, Va.(178)



Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 5-27-93

Produced by:
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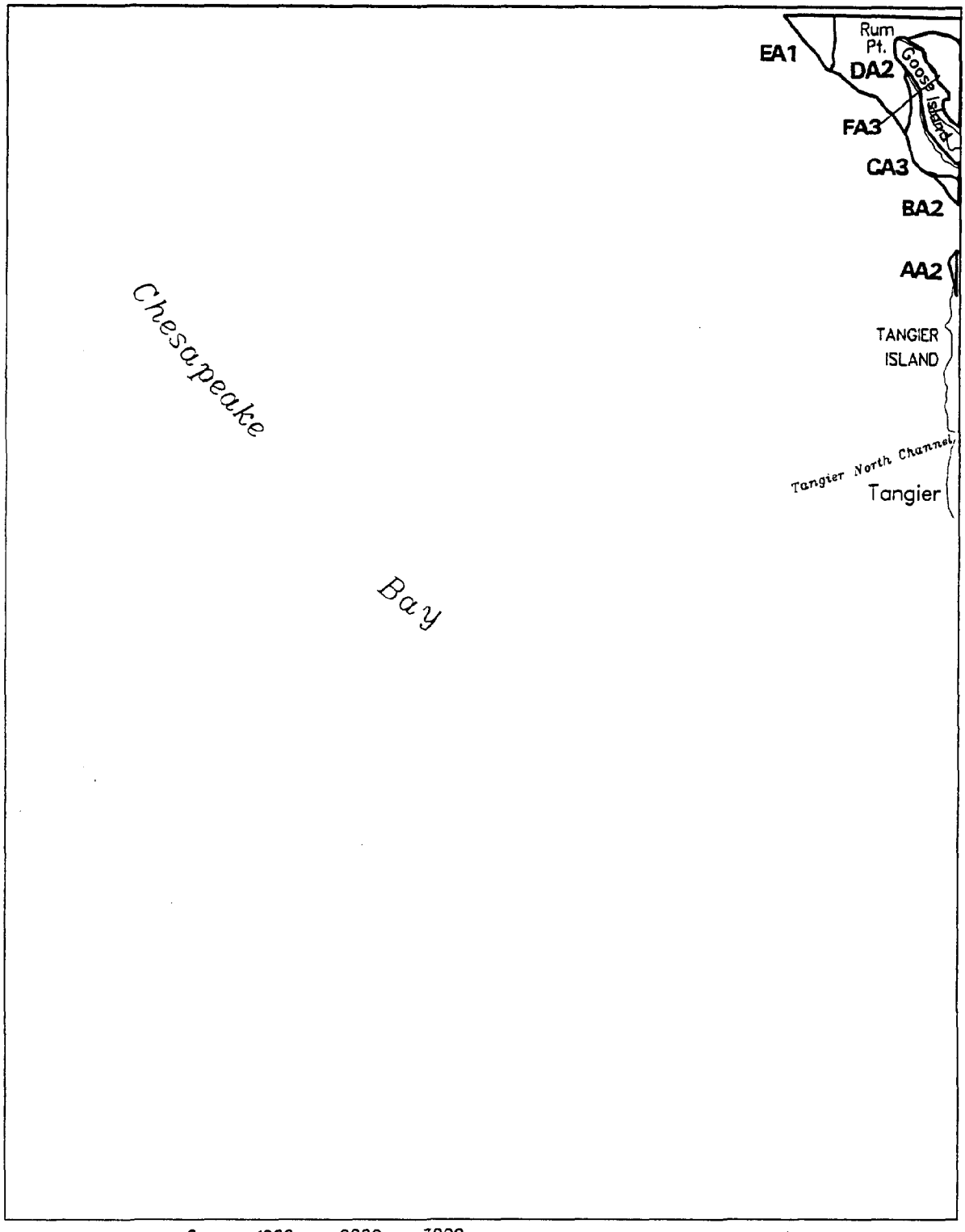
SUBMERGED AQUATIC VEGETATION 1993
Goose Island, Va.(179)



Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 6-24-93

Produced by:
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College of William and Mary

APPENDIX D

Number of Square Meters of SAV for Individual Beds and Totals for Density Categories for Each USGS 7.5 Minute Quadrangle in 1993.

APPENDIX D

Number of Square Meters of SAV for Individual Beds and Totals for Density Categories for Each USGS 7.5 Minute Quadrangle in 1993. [See Maps in Appendix C for Location of Each Bed. Quadrangles Are Listed Numerically by VIMS Map Number. Slight Differences (1 Square Meter) in Quadrangle Totals from Density Totals Are Due to Rounding.]

Aberdeen, Md.	
VIMS Map # 002	
AA4	10,623
BA4	3,965
CA4	4,605
DA4	3,231
EA3	38,260
FA4	1,985
GA4	4,004
HA4	4,950
IA4	5,202
JA4	5,310
Density 1 =	0
Density 2 =	0
Density 3 =	38,260
Density 4 =	43,875
Total =	82,135

Havre de Grace, Md.	
VIMS Map # 003	
AA2	6,912
BA2	36,408
CA2	15,480
DA2	492,198
EA1	15,035,720
FA4	291,283
GA3	14,209
HA4	3,486
IA4	2,401
JA4	5,576
KA4	187,414
LA4	2,586
MA4	35,171
NA4	2,224
OA4	3,327
PA4	7,987
QA4	7,730
RA4	83,478
SA4	10,085
TA3	176,400
UA3	27,446
VA3	7,336
WA4	36,877
XA4	13,206
YA4	16,779
ZA3	8,578
AB4	45,036
BB4	19,711
CB4	2,797
DB4	355
EB4	4,225
FB4	6,399
GB4	8,972
HB4	10,674
IB4	3,894
JB4	58,009
KB3	12,680
LB1	139,702
MB4	303,096
NB4	102,168
OB3	41,014
PB3	40,838
QB2	11,377
RB2	6,160
Density 1 =	15,175,422

Density 2 =	568,534
Density 3 =	328,501
Density 4 =	1,274,946
Total =	17,347,404

North East, Md.
VIMS Map # 004

AA2	16,494
BA1	4,915
CA1	35,490
DA1	387,755
EA1	5,404
FA1	11,723
Density 1 =	445,288
Density 2 =	16,494
Density 3 =	0
Density 4 =	0
Total =	461,782

Perryman, Md.
VIMS Map # 008

AA4	11,853
BA3	1,735
CA2	22,322
DA2	18,468
EA2	4,915
FA2	2,780
GA2	947
HA2	5,555
IA2	11,749
Density 1 =	0
Density 2 =	66,735
Density 3 =	1,735
Density 4 =	11,853
Total =	80,323

Spesutie, Md.
VIMS Map # 009

AA1	2,853
BA2	16,502
CA3	42,960
DA3	4,046
EA4	2,461
FA4	2,497
GA1	6,993
HA2	9,069
IA2	7,266
JA2	9,968
KA2	1,222
LA2	3,700
MA2	5,471
NA2	14,313
OA2	14,797
PA2	7,030
QA2	3,856
RA2	34,459
SA4	52,102
TA3	37,248
UA2	12,322
VA2	6,115
WA3	3,084
XA2	7,713
YA3	39,576
ZA3	12,957
AB2	4,619
BB2	2,146
CB2	9,178
DB2	5,491
EB2	2,292
FB2	2,997
GB2	2,896
HB3	22,824
IB2	17,177
JB2	26,946
KB4	4,090
LB2	1,965
Density 1 =	9,846

Density 2 =	229,511
Density 3 =	162,695
Density 4 =	61,151
Total =	463,203

Earleville, Md.
VIMS Map # 010

AA2	27,658
BA2	20,864
CA3	22,022
DA2	4,763
EA1	5,054
FA3	28,008
GA1	4,283
HA1	9,825
IA1	7,475
JA2	22,850
KA2	83,240
LA2	67,615
MA3	102,357
NA1	13,908
OA1	92,305
PA4	22,119
Density 1 =	132,850
Density 2 =	226,988
Density 3 =	152,387
Density 4 =	22,119
Total =	534,344

Middle River, Md.
VIMS Map # 013

AA1	23,977
BA2	17,951
CA2	3,797
DA2	8,927
Density 1 =	23,977
Density 2 =	30,675
Density 3 =	0
Density 4 =	0
Total =	54,652

Gunpowder Neck, Md.
VIMS Map # 014

AA2	7,645
BA3	71,640
CA3	109,485
DA2	11,623
EA2	5,954
FA2	79,626
GA1	7,153
HA2	130,536
IA3	42,345
JA2	12,071
Density 1 =	7,153
Density 2 =	247,455
Density 3 =	223,470
Density 4 =	0
Total =	478,077

Hanesville, Md.
VIMS Map # 015

AA2	22,156
BA2	17,506
CA2	2,748
Density 1 =	0
Density 2 =	42,410
Density 3 =	0
Density 4 =	0
Total =	42,410

Betterton, Md.
VIMS Map # 016

AA3	52,089
BA3	58,893
CA1	451,654
DA2	18,408
EA1	102,758
FA1	3,036
GA1	3,101
Density 1 =	560,549
Density 2 =	18,408
Density 3 =	110,982
Density 4 =	0
Total =	689,939

Galena, Md.
VIMS Map # 017

AA1	25,134
BA4	11,851
CA1	7,827
Density 1 =	32,961
Density 2 =	0
Density 3 =	0
Density 4 =	11,851
Total =	44,812

Swan Point, Md.
VIMS Map # 020

AA2	15,021
BA2	36,209
CA2	25,036
DA2	22,208
EA2	22,464
FA3	16,180
GA2	16,758
HA2	5,053
IA2	17,249
Density 1 =	0
Density 2 =	159,999
Density 3 =	16,180
Density 4 =	0
Total =	176,179

Rock Hall, Md.
VIMS Map # 021

AA3	8,980
BA3	32,168
CA3	45,905
DA3	17,046
EA2	51,725
FA2	56,875
GA3	18,826
HA3	52,529
IA2	27,962
JA2	14,316
Density 1 =	0
Density 2 =	150,877
Density 3 =	175,454
Density 4 =	0
Total =	326,331

Gibson Island, Md.
VIMS Map # 024

AA2	8,372
BA2	10,063
CA2	2,731
DA2	11,887
EA2	36,515
FA2	41,803
GA2	9,950
HA2	3,533
IA3	7,199
Density 1 =	0
Density 2 =	124,853
Density 3 =	7,199

Density 4 =	0
Total =	132,053

Langford Creek, Md.
VIMS Map # 026

AA2	181,677
BA3	89,381
CA2	32,436
DA1	8,524
EA2	20,726
FA3	2,755
GA3	252,439
HA3	20,997
IA3	66,840
JA2	266,908
KA2	15,768
LA3	593,427
MA2	89,117
NA2	94,264
OA3	711,225
PA2	163,026
QA3	17,679
RA2	58,953
SA4	1,812,486
TA1	682,127
Density 1 =	690,651
Density 2 =	922,874
Density 3 =	1,754,742
Density 4 =	1,812,486
Total =	5,180,753

Washington West, Md.-D.C.-Va.
VIMS Map # 028

AA3	16,659
BA4	16,876
CA3	15,279
DA3	2,272
EA4	4,128
FA2	2,751
GA4	5,456
HA4	32,943
IA4	43,663
JA4	20,559
KA4	49,172
LA3	16,506
MA3	25,891
Density 1 =	0
Density 2 =	2,751
Density 3 =	76,608
Density 4 =	172,797
Total =	252,155

Washington East, D.C.-Md.
VIMS Map # 029

AA4	7,488
Density 1 =	0
Density 2 =	0
Density 3 =	0
Density 4 =	7,488
Total =	7,488

Kent Island, Md.
VIMS Map # 032

AA1	34,778
BA2	54,915
CA2	63,033
DA2	7,827
EA3	106,443
FA2	36,311
GA1	260,838
HA2	250,947
IA2	32,062
JA1	118,582
KA1	23,046
LA1	2,723

MA1	
NA3	64,349
OA1	130,882
PA1	74,770
QA3	97,131
RA1	66,661
SA2	17,845
TA2	84,933
	15,598
Density 1 =	
Density 2 =	694,062
Density 3 =	545,625
Density 4 =	303,986
	0
Total =	1,543,674

Queenstown, Md.
VIMS Map # 033

AA1	
BA1	82,905
CA3	85,278
DA1	9,866
EA1	317,597
FA1	186,622
GA1	28,630
HA1	65,561
IA3	139,901
JA3	247,181
KA2	45,585
LA3	6,589
MA3	64,659
NA3	119,707
OA1	21,071
PA3	59,738
QA1	44,134
RA2	139,346
SA2	73,307
TA3	46,490
	29,929
Density 1 =	
Density 2 =	1,105,577
Density 3 =	126,386
	582,133
Density 4 =	
	0
Total =	1,814,096

Alexandria, Va.-D.C.-Md.
VIMS Map # 034

AA3	
BA3	23,704
CA3	817
DA3	1,587
EA3	7,243
FA2	3,463
GA2	2,035
HA4	4,477
IA3	41,631
JA3	74,270
KA4	4,799
LA2	14,762
MA3	10,171
NA2	33,668
OA1	23,199
PA4	5,469
QA1	33,798
RA2	7,661
SA4	2,621
TA3	3,438
UA4	4,177
VA4	6,669
WA4	19,418
XA2	168,982
YA4	233,107
ZA3	121,705
AB4	29,752
BB3	38,480
CB3	4,751
DB3	2,193
EB3	19,891
FB3	5,525
GB3	587,493
HB2	50,115
IB4	61,661
JB4	28,147
	30,838

KB3	20,022	VA2	9,071
LB4	2,318	WA3	28,831
MB4	33,840	XA3	42,923
NB3	3,975	YA1	1,197,597
OB4	1,055,214	ZA1	272,754
PB4	202,074	AB3	120,067
QB1	174,935	BB1	356,523
RB3	1,337	CB1	177,298
SB3	12,206	DB1	462,753
TB4	60,459	EB2	18,392
UB2	86,476	FB2	237,583
Density 1 =	188,065	Density 1 =	2,502,278
Density 2 =	423,748	Density 2 =	1,395,609
Density 3 =	890,989	Density 3 =	235,859
Density 4 =	1,861,772	Density 4 =	132,326
Total =	3,364,573	Total =	4,266,072

Claiborne, Md.
VIMS Map # 036

St. Michaels, Md.
VIMS Map # 037

AA2	143,972	AA4	11,129
BA2	88,346	BA4	42,944
CA2	135,678	CA4	21,301
DA2	285,527	DA4	12,731
EA2	135,821	EA2	166,524
FA4	23,457	FA3	30,561
GA1	35,354	GA3	13,271
HA2	40,316	HA3	8,981
IA2	23,088	IA3	19,766
JA2	26,420	JA3	14,473
KA4	6,020	KA4	67,074
LA3	14,147	LA2	37,823
MA4	33,135	MA3	310,417
NA3	5,556	NA2	28,588
OA4	23,949	OA2	9,212
PA3	14,131	PA2	31,559
QA3	10,205	QA3	5,347
RA4	45,765	RA4	17,657
SA2	215,538	SA4	118,499
TA2	19,168	TA1	400,146
UA2	16,690	UA1	240,525

VA1	90,839
WA2	39,829
XA4	127,926
YA1	38,523
ZA3	80,182
AB2	27,025
BB1	15,224
CB1	51,320
DB1	172,068
EB3	240,026
FB3	215,530
Density 1 =	1,008,645
Density 2 =	340,559
Density 3 =	938,553
Density 4 =	419,261
Total =	2,707,020

Fort Belvoir, Va.-Md.
VIMS Map # 039

AA2	16,453
BA2	12,429
CA3	11,791
DA4	147,365
EA1	259,001
FA2	113,325
GA3	260,311
HA3	238,904
IA4	54,361
Density 1 =	259,001
Density 2 =	142,207
Density 3 =	511,006
Density 4 =	201,726
Total =	1,113,940

Mt. Vernon, Va.-Md.
VIMS Map # 040

AA4	60,590
BA4	1,528,021
CA4	147,481
DA3	87,525
EA1	7,988
FA4	57,452
GA4	55,556
HA2	39,803
IA4	39,713
JA2	32,280
KA2	6,248
LA4	7,526
MA3	284,163
NA2	2,508
OA1	7,662
Density 1 =	15,650
Density 2 =	80,838
Density 3 =	371,688
Density 4 =	1,896,340
Total =	2,364,516

Lower Marlboro, Md.
VIMS Map # 041

AA2	87,762
Density 1 =	0
Density 2 =	87,762
Density 3 =	0
Density 4 =	0
Total =	87,762

Tilghman, Md.
VIMS Map # 043

AA2	81,660
BA2	61,123
CA2	146,359
DA2	47,620
EA2	65,504
FA2	550,611

GA2	145,389
HA2	1,448,200
IA3	214,135
JA2	9,854
KA3	639,001
LA2	301,328
MA2	49,803
NA4	9,663
OA2	5,868
PA2	37,103
QA2	126,616
Density 1 =	0
Density 2 =	3,077,036
Density 3 =	853,136
Density 4 =	9,663
Total =	3,939,835

Oxford, Md.
VIMS Map # 044

AA2	31,931
BA3	16,257
CA3	12,318
DA3	266,368
EA3	58,281
FA4	16,961
GA2	641,424
HA2	230,766
IA2	26,201
JA2	42,658
KA2	21,775
LA3	14,626
MA2	105,290
NA2	747,753
OA2	509,250
PA2	816,097
QA3	35,259
RA2	8,784
SA3	7,206
TA3	29,194
UA3	10,427
VA3	13,864
WA2	31,442
XA4	5,137
YA4	5,093
ZA4	8,120
AB4	6,319
BB4	39,685
CB2	173,149
DB4	152,335
EB3	131,276
FB2	145,470
GB1	82,614
Density 1 =	82,614
Density 2 =	3,531,989
Density 3 =	595,076
Density 4 =	233,649
Total =	4,443,327

Quantico, Va.-Md.
VIMS Map # 047

AA4	622,384
BA4	1,240,126
CA4	807,689
DA4	80,918
EA2	25,480
FA4	106,001
GA3	9,604
HA4	165,627
IA4	131,418
JA1	151,976
KA4	122,806
LA2	28,421
MA4	744,292
NA4	1,113,691
OA4	290,166
PA4	115,126
QA2	4,598
RA4	4,541
SA4	234,407

Density 1 =	151,976
Density 2 =	58,498
Density 3 =	9,604
Density 4 =	5,779,192
Total =	5,999,270

Indian Head, Md.- Va.
VIMS Map # 048

AA2	133,033
BA4	1,963,088
CA2	148,112
DA3	26,142
EA3	42,922
FA2	6,106
GA4	95,480
HA4	673,932
IA4	70,812
JA4	273,590
KA2	12,416
LA3	14,882
Density 1 =	0
Density 2 =	299,667
Density 3 =	83,946
Density 4 =	3,076,902
Total =	3,460,515

Hudson, Md.
VIMS Map # 051

AA2	40,112
BA2	122,265
CA2	48,812
DA2	217,725
EA2	15,136
FA2	13,268
GA3	6,002
HA2	109,399
IA3	51,465
JA2	20,521
KA1	1,946,211
LA3	748,812
MA1	930,270
NA3	112,302
OA3	735,026
PA2	556,176
Density 1 =	2,876,481
Density 2 =	1,143,415
Density 3 =	1,653,607
Density 4 =	0
Total =	5,673,503

Church Creek, Md.
VIMS Map # 052

AA2	228,801
BA2	586,192
CA1	438,145
DA2	127,628
EA2	4,744
FA2	11,661
GA2	11,711
HA2	30,762
IA3	18,535
JA2	32,606
Density 1 =	438,145
Density 2 =	1,034,105
Density 3 =	18,535
Density 4 =	0
Total =	1,490,785

Cambridge, Md.
VIMS Map # 053

AA1	40,220
Density 1 =	40,220
Density 2 =	0
Density 3 =	0

Density 4 =	0
Total =	40,220

Widewater, Va.-Md.
VIMS Map # 055

AA3	1,379
BA3	4,039
CA4	20,070
DA4	3,220
EA3	155,903
FA4	236,839
GA2	141,296
HA4	49,146
IA1	224,465
JA4	3,804,912
KA4	66,323
LA4	148,842
MA2	37,971
NA4	432,110
OA1	27,357
PA4	793,190
QA3	4,159
RA4	76,065
SA3	7,142
Density 1 =	251,821
Density 2 =	179,267
Density 3 =	172,622
Density 4 =	5,630,716
Total =	6,234,427

Nanjemoy, Md.
VIMS Map # 056

AA4	395,871
BA4	9,985
CA4	10,290
DA3	3,360
EA2	55,501
FA2	23,469
GA4	5,122
HA4	35,538
IA4	20,877
JA4	33,261
KA4	40,129
LA4	16,166
MA4	26,413
NA2	34,780
OA2	33,306
PA3	2,148
QA2	7,537
RA3	2,697
SA2	130,386
TA2	3,225
Density 1 =	0
Density 2 =	288,203
Density 3 =	8,205
Density 4 =	593,652
Total =	890,060

Mathias Point, Md.-Va.
VIMS Map # 057

AA1	92,763
BA2	172,896
CA2	13,208
DA3	118,509
EA4	165,580
FA3	43,772
GA4	134,996
HA2	27,214
IA4	113,987
JA2	5,638
KA4	53,163
LA4	207,900
MA3	68,539
NA4	519,039
OA3	229,039
PA2	28,926
QA2	40,249
RA3	7,552

SA4	1,286
TA4	11,037
UA2	5,850
VA3	71,654
WA3	50,314
XA4	86,643
YA2	52,804
ZA4	121,215
AB4	32,165
BB3	1,152
CB3	1,230
DB2	5,673
EB4	5,464
FB3	38,939
Density 1 =	92,763
Density 2 =	352,459
Density 3 =	630,701
Density 4 =	1,452,474
Total =	2,528,397

Popes Creek, Md.
VIMS Map # 058

AA2	11,198
BA2	4,042
Density 1 =	0
Density 2 =	15,240
Density 3 =	0
Density 4 =	0
Total =	15,240

Taylors Island, Md.
VIMS Map # 062

AA2	2,643
BA2	23,766
CA2	41,110
DA2	208,877
EA2	62,213
FA2	497,848
GA2	165,481
Density 1 =	0
Density 2 =	1,001,938
Density 3 =	0
Density 4 =	0
Total =	1,001,938

Golden Hill, Md.
VIMS Map # 063

AA1	221,952
BA1	92,852
CA2	285,266
DA2	8,554
EA2	26,300
FA1	16,078
Density 1 =	330,882
Density 2 =	320,120
Density 3 =	0
Density 4 =	0
Total =	651,002

Passapatanzy, Md.-Va.
VIMS Map # 064

AA3	14,729
BA2	23,718
CA4	8,316
DA4	19,214
Density 1 =	0
Density 2 =	23,718
Density 3 =	14,729
Density 4 =	27,530
Total =	65,977

King George, Va.-Md.

VIMS Map # 065

AA3	301,022
BA4	281,725
CA4	207,932
Density 1 =	0
Density 2 =	0
Density 3 =	301,022
Density 4 =	489,657
Total =	790,678

Dahlgren, Va.-Md.
VIMS Map # 066

AA4	7,549
BA2	1,298
CA3	2,399
DA3	2,149
EA4	4,732
FA2	200,771
GA4	66,813
Density 1 =	0
Density 2 =	202,069
Density 3 =	4,548
Density 4 =	79,095
Total =	285,711

Colonial Beach North, Va.-Md.
VIMS Map # 067

AA3	30,754
BA3	91,212
CA4	1,897
DA4	9,310
EA2	7,376
FA3	45,228
GA3	71,195
HA3	67,588
IA2	112,948
JA4	58,263
KA2	2,265
Density 1 =	0
Density 2 =	122,589
Density 3 =	305,976
Density 4 =	69,470
Total =	498,036

Solomons Island, Md.
VIMS Map # 071

AA3	9,946
Density 1 =	0
Density 2 =	0
Density 3 =	9,946
Density 4 =	0
Total =	9,946

Barren Island, Md.
VIMS Map # 072

AA2	269,424
BA2	51,814
CA2	1,737,049
Density 1 =	0
Density 2 =	2,058,287
Density 3 =	0
Density 4 =	0
Total =	2,058,287

Honga, Md.
VIMS Map # 073

AA2	54,418
BA3	111,650
CA2	150,599
DA3	101,676

EA4	129,423
FA3	81,309
GA3	12,278
HA3	136,613
IA2	83,842
JA2	30,691
KA2	115,130
LA2	35,841
MA2	556,600
NA2	700,560
OA2	444,626
PA1	79,705
QA3	196,656
RA2	708,805
SA2	148,834
TA2	1,096,728
UA2	519,629
VA2	73,193
WA4	649,376
XA2	453,334
YA3	2,218,390
ZA1	117,741
AB2	69,271
BB2	125,357
CB3	99,749
DB2	302,853
EB4	43,244
FB2	115,059
GB4	1,832,192
HB1	142,651
IB3	506,015
JB2	581,679
KB3	83,414
LB4	397,950
MB3	19,169
NB1	77,979
Density 1 =	418,076
Density 2 =	6,367,050
Density 3 =	3,566,918
Density 4 =	3,052,184
Total =	13,404,228

Wingate, Md.
VIMS Map # 074

AA2	14,888
BA3	163,024
CA2	177,955
DA1	131,752
EA2	121,494
FA4	1,253,053
GA3	326,920
HA3	3,019,290
IA3	200,478
Density 1 =	131,752
Density 2 =	314,337
Density 3 =	3,709,712
Density 4 =	1,253,053
Total =	5,408,854

St. Marys City, Md.
VIMS Map # 080

AA2	88,860
BA2	33,727
Density 1 =	0
Density 2 =	122,587
Density 3 =	0
Density 4 =	0
Total =	122,587

Richland Point, Md.
VIMS Map # 082

AA2	272,674
BA1	94,232
CA2	43,738
Density 1 =	94,232
Density 2 =	316,412
Density 3 =	0

Density 4 =	0
Total =	410,644

Bloodsworth Island, Md.
VIMS Map # 083

AA2	3,848,825
BA3	193,864
CA1	46,994
DA1	27,625
EA2	1,352,151
FA2	237,870
GA2	297,033
HA1	125,226
IA2	1,116,782
JA1	48,791
KA1	17,532
LA1	4,827
MA3	665,084
NA1	160,198
OA1	106,920
PA2	158,280
QA3	19,958
RA2	65,406
SA2	75,822
TA2	24,832
UA2	21,467
VA2	12,104
WA2	3,213
Density 1 =	538,114
Density 2 =	7,213,787
Density 3 =	878,907
Density 4 =	0
Total =	8,630,807

Deal Island, Md.
VIMS Map # 084

AA1	13,881
BA3	317,222
CA2	38,905
DA2	61,792
EA2	9,656
FA2	3,263
GA2	326,168
Density 1 =	13,881
Density 2 =	439,784
Density 3 =	317,222
Density 4 =	0
Total =	770,887

Monie, Md.
VIMS Map # 085

AA2	40,900
BA2	21,179
CA1	8,790
Density 1 =	8,790
Density 2 =	62,079
Density 3 =	0
Density 4 =	0
Total =	70,868

St. George Island, Md.-Va.
VIMS Map # 089

AA2	29,998
BA2	12,628
Density 1 =	0
Density 2 =	42,625
Density 3 =	0
Density 4 =	0
Total =	42,625

Kedges Straits, Md.
VIMS Map # 091

AA3	72,589
BA2	80,327
CA4	153,233
DA4	2,718,547
EA2	403,684
FA2	107,149
GA3	281,792
HA3	1,464,037
IA2	404,811
JA2	52,418
KA2	458,640
LA2	23,475
MA4	471,069
NA2	4,130
OA3	804,109
PA2	546,099
QA2	126,753
RA2	60,367
SA3	256,227
TA2	389,167
UA3	150,207
VA3	5,565
Density 1 =	0
Density 2 =	2,657,022
Density 3 =	3,034,526
Density 4 =	3,342,848
Total =	9,034,396

Terrapin Sand Point, Md.
VIMS Map # 092

AA2	28,535
BA3	1,642,170
CA1	151,415
DA3	319,546
EA4	73,255
GA3	16,748
HA2	10,795
IA3	36,889
JA1	34,405

Density 1 =	185,820
Density 2 =	39,330
Density 3 =	2,015,353
Density 4 =	73,255
Total =	2,313,758

Marion, Md.
VIMS Map # 093

AA2	6,318
BA2	3,808
CA2	5,916
DA2	19,783
EA2	196,379
FA3	118,760
GA2	123,843
HA4	83,722
IA2	174,969
JA2	30,656
KA3	600,519
LA2	15,759
MA2	24,666
NA3	3,044
OA2	8,390
PA2	15,019
QA3	105,620
RA2	132,729
SA3	290,373
TA1	108,946
UA2	41,187
VA2	74,382
WA4	14,717
XA3	69,264
YA3	181,703
ZA1	78,725
AB2	58,028
BB3	6,402
CB3	71,431
DB2	27,887
EB2	227,259
FB2	10,494
GB2	8,716

Density 1 =	187,671
Density 2 =	1,206,188
Density 3 =	1,447,116
Density 4 =	98,439
Total =	2,939,413

Ewell, Md.-Va.
VIMS Map # 099

AA3	216,266
BA2	115,887
CA4	101,709
DA4	29,564
EA4	872,698
FA4	32,024
GA3	202,924
HA1	71,250
IA2	56,683
JA2	110,220
KA2	430,638
LA3	130,185
MA2	123,674
NA4	136,823
OA3	67,488
PA3	117,019
QA2	63,052
RA2	2,748,561
SA2	5,707,851
TA2	33,945
UA3	559,630
VA2	16,022
WA2	1,656,751
XA1	3,366,268
YA2	639,625
ZA4	6,159,700
Density 1 =	3,437,518
Density 2 =	11,702,910
Density 3 =	1,293,511
Density 4 =	7,332,517
Total =	23,766,456

Great Fox Island, Md.-Va.
VIMS Map # 100

AA2	2,007,255
BA2	555,855
CA2	127,135
DA2	2,168,475
EA3	615,837
FA1	15,995
GA1	14,836
HA1	14,926
IA3	145,223
JA1	69,010
KA4	79,210
LA3	691,348
MA2	140,172
NA2	250,552
OA2	640,730
PA3	177,253
QA4	3,562,095
RA2	3,555,152
Density 1 =	114,766
Density 2 =	9,445,325
Density 3 =	1,629,661
Density 4 =	3,641,305
Total =	14,831,057

Crisfield, Md.-Va.
VIMS Map # 101

AA2	58,051
BA2	652,694
CA3	792,589
DA2	7,740
EA2	276,746
FA3	179,214
GA2	63,931
HA3	87,440
IA2	96,408
JA2	14,482
KA2	13,964

LA2	17,092
MA2	98,419
NA3	8,979
OA2	114,745
PA2	6,785
QA3	116,207
RA2	3,101
SA4	92,696
TA3	22,296
UA2	3,972
VA2	3,048
WA2	31,392
XA2	45,839
YA4	367,981
ZA4	216,961
Density 1 =	0
Density 2 =	1,508,411
Density 3 =	1,206,724
Density 4 =	677,637
Total =	3,392,772

Saxis, Va.-Md.
VIMS Map # 102

AA3	2,199
BA3	11,247
CA3	4,770
DA2	2,774
Density 1 =	0
Density 2 =	2,774
Density 3 =	18,216
Density 4 =	0
Total =	20,989

Reedville, Va.
VIMS Map # 106

AA1	26,618
BA2	153,070
CA4	1,332,697
DA1	612,218
EA2	465,916
FA4	271,231
GA2	161,507
HA2	18,384
Density 1 =	638,835
Density 2 =	798,877
Density 3 =	0
Density 4 =	1,603,928
Total =	3,041,641

Tangier Island, Va.
VIMS Map # 107

AA3	479,651
BA2	111,017
CA4	1,387,394
DA2	33,520
EA2	116,127
FA2	55,185
GA2	112,291
HA2	858,845
IA2	2,040,244
JA3	522,678
Density 1 =	0
Density 2 =	3,327,229
Density 3 =	1,002,329
Density 4 =	1,387,394
Total =	5,716,952

Chesconessex, Va.
VIMS Map # 108

AA2	162,709
BA1	112,141
CA3	149,106
DA2	19,727
EA2	146,537

FA3	1,483
GA2	723
HA3	447
IA3	351
JA3	173,465
KA2	142,068
LA3	688,124
MA1	225,876
NA2	125,414
OA3	290,171
PA2	12,396
QA4	777,968
RA2	85,643
SA4	393,952
TA3	473,711
UA1	409,642
VA1	568,709
WA3	444,519
XA4	532,651
YA2	374,591
ZA4	326,647
AB2	443,885
BB4	814,470
CB3	65,346
DB3	4,215
EB3	4,311
FB4	70,933
GB4	716,478
HB2	548,499
IB3	1,024,603
JB1	275,802
KB2	51,545
LB2	4,265
MB2	125,657
NB4	125,546
OB2	125,221
Density 1 =	1,592,169
Density 2 =	2,368,882
Density 3 =	3,319,851
Density 4 =	3,758,645
Total =	11,039,547

Parksley, Va.
VIMS Map # 109

AA2	8,433
BA2	165,552
CA2	24,829
DA2	19,424
EA3	1,444
FA2	513,349
GA4	2,582,470
HA2	112,918
IA2	3,003
JA2	168,021
KA3	172,574
LA2	53,554
MA3	19,941
NA2	81,089
OA3	273,809
PA2	190,562
QA4	154,546
RA3	246,851
SA2	17,035
TA2	1,615
UA2	2,854
VA2	14,304
WA2	8,237
XA3	38,561
YA2	2,505
ZA3	3,969
AB2	833
BB3	98,369
CB2	56,746
DB3	17,865
EB3	15,896
FB1	34,567
Density 1 =	34,567
Density 2 =	1,444,863
Density 3 =	889,278
Density 4 =	2,737,016
Total =	5,105,725

Irvington, Va.
VIMS Map # 111

AA2	981
BA2	5,187
CA2	87,812
DA2	4,483
EA2	2,496
FA2	17,581
GA3	14,755
HA2	472,287
IA2	271,416
JA2	219,124
KA2	35,080
LA2	57,775
MA2	81,547
NA2	36,389
OA2	3,199
PA2	28,186
QA2	4,677
RA2	1,208
SA2	1,190
TA2	764
UA3	42,769
VA1	7,933
WA2	6,911
XA2	35,968
YA2	108,791
ZA2	50,866
Density 1 =	7,933
Density 2 =	1,533,921
Density 3 =	57,524
Density 4 =	0
Total =	1,599,378

Fleets Bay, Va.
VIMS Map # 112

AA2	1,092,599
BA3	95,883
CA2	31,648
DA2	2,419
EA3	325,705
FA1	429,423
GA2	154,314
HA4	28,534
IA2	337,280
JA2	8,777
KA2	26,167
LA2	22,850
MA2	22,878
NA2	47,720
OA2	64,204
PA3	990,149
QA1	186,208
RA3	380,626
SA2	113,021
TA3	11,004
UA2	27,819
VA2	17,176
WA2	12,294
XA2	298,697
YA2	119,261
ZA2	6,050
AB2	80,585
BB2	110,806
CB2	33,766
DB1	11,359
Density 1 =	626,990
Density 2 =	2,630,332
Density 3 =	1,803,367
Density 4 =	28,534
Total =	5,089,223

Nandua Creek, Va.
VIMS Map # 113

AA1	38,867
BA2	54,131
CA1	89,616
DA3	111,926
EA2	2,079

FA1	213,618
GA4	551,257
HA2	1,229,227
IA4	215,427
JA3	101,253
KA1	855,446
LA4	436,854
MA2	776,376
Density 1 =	1,197,547
Density 2 =	2,061,813
Density 3 =	213,179
Density 4 =	1,203,538
Total =	4,676,077

Pungoteague, Va.
VIMS Map # 114

AA3	106,434
BA4	66,930
CA2	560,107
DA2	9,534
EA2	8,819
FA2	70,767
GA4	299,851
HA2	66,845
IA2	43,294
JA2	3,634
KA1	23,412
LA4	3,634,723
MA2	76,428
NA1	29,303
OA2	2,229,186
PA2	65,632
QA3	54,988
RA1	165,217
SA2	111,687
TA3	286,918
UA2	356,509
VA3	312,288
WA2	1,837
XA2	820
YA3	3,503
ZA2	19,047
AB3	14,553
BB2	8,760
CB3	9,791
DB2	18,817
EB2	118,470
FB3	813
GB3	1,227
HB3	47,038
IB2	8,141
JB3	77,540
KB2	243,124
LB1	320,040
MB2	365,800
NB1	18,127
OB2	28,441
PB3	34,042
QB2	120,368
RB2	9,421
SB2	30,932
Density 1 =	556,098
Density 2 =	4,576,419
Density 3 =	949,135
Density 4 =	4,001,505
Total =	10,083,157

Wilton, Va.
VIMS Map # 117

AA2	45,580
BA2	10,833
CA2	6,145
DA2	35,768
EA2	91,613
FA2	3,020
GA2	136,066
HA2	4,291
IA1	32,147
JA1	3,175
KA1	50,249

LA2	8,174
MA2	13,807
Density 1 =	85,571
Density 2 =	355,296
Density 3 =	0
Density 4 =	0
Total =	440,867

Deltaville, Va.
VIMS Map # 118

AA2	10,146
BA1	41,927
CA2	373,342
DA3	105,289
EA1	164,164
FA2	55,097
GA4	160,976
HA2	68,287
IA2	247,642
JA2	6,435
KA2	39,553
LA2	30,121
MA2	108,574
NA2	8,725
OA2	891
PA2	21,855
QA2	75,863
RA2	14,165
SA2	15,327
TA2	18,093
UA2	70,337
VA2	29,921
WA2	19,234
XA2	1,713
YA2	30,270
ZA2	2,377
AB2	6,294
BB2	68,552
CB1	242,596
DB4	130,592

Density 1 =	448,687
Density 2 =	1,322,811
Density 3 =	105,289
Density 4 =	291,568
Total =	2,168,355

Jamesville, Va.
VIMS Map # 119

AA2	42,545
BA1	141,125
CA2	604,008
DA4	846,200
EA1	31,080
FA2	85,918
GA1	46,281
HA2	89,517
IA2	9,525
JA2	66,392
KA3	3,193
LA4	19,584
MA3	79,992
NA2	1,142,351
OA4	186,740
PA1	420,512
QA2	271,411
RA2	16,820
SA2	72,575
TA4	520,717
UA1	25,096
VA3	214,992
WA2	3,002
XA2	705,797
YA4	194,730
ZA2	189,598
AB4	294,521
BB1	11,115
CB1	80,152
DB4	148,988
EB2	198,661
FB2	2,099
GB2	72,988

Density 1 =	755,362
Density 2 =	3,573,205
Density 3 =	298,177
Density 4 =	2,211,479
Total =	6,838,223

Ware Neck, Va.
VIMS Map # 122

AA2	4,757
BA2	518,979
CA2	40,723
DA2	200,797
EA3	248,308
FA1	53,550
GA3	81,950
HA2	105,225
IA2	106,296
JA2	165,508
KA3	154,296
LA4	478,619
MA2	301,667
NA4	196,776
OA4	106,426
PA3	367,057
Density 1 =	53,550
Density 2 =	1,443,954
Density 3 =	851,612
Density 4 =	781,821
Total =	3,130,937

Mathews, Va.
VIMS Map # 123

AA1	3,070
BA1	9,290
CA3	440,487
DA3	20,681
EA2	123,206
FA2	61,728
GA2	25,549
HA2	26,579
IA4	180,713
JA4	54,320
KA2	214,113
LA2	75,055
MA2	51,958
NA4	36,990
OA4	30,952
PA2	5,946
QA1	38,463
RA2	209,846
SA4	612
TA4	19,129
UA4	8,417
VA4	57,530
WA2	151,660
XA2	61,709
YA2	50,174
ZA3	88,335
AB1	53,335
BB3	662,203
CB2	121,522
DB4	131,354
EB2	20,498
FB2	190,656
GB3	698,931
HB1	33,783
Density 1 =	137,941
Density 2 =	1,390,198
Density 3 =	1,910,636
Density 4 =	520,017
Total =	3,958,793

Franktown, Va.
VIMS Map # 124

AA4	108,305
BA1	912,909
CA3	56,157
DA4	300,471

EA2	61,588
FA2	58,182
GA3	748,442
HA3	23,366
IA3	145,378
JA2	32,340
KA2	33,058
LA2	4,282
MA4	214,354
NA2	6,662
OA2	200,981
PA4	1,535,808
QA2	483,758
RA1	52,151
SA1	56,563
TA2	85,401
UA1	428,174
VA3	64,722
WA3	116,720
XA1	303,037
YA4	328,033
ZA2	147,831
AB4	140,078
BB2	67,563
CB2	27,962
DB2	16,221
EB2	13,104
FB3	152,500
GB2	24,113
HB2	99,752
IB2	13,129
JB2	21,419
KB2	4,355
LB3	183,169
MB2	51,834
NB2	127,734
OB1	112,966
PB2	113,826
Density 1 =	1,865,799
Density 2 =	1,695,097
Density 3 =	1,490,454
Density 4 =	2,627,049

Total =	7,678,399
Achilles, Va.	
VIMS Map # 131	
AA4	65,377
BA4	59,867
CA4	80,012
DA4	1,181,695
EA2	229,512
FA4	61,069
GA4	1,325,538
HA2	142,564
IA2	178,298
JA4	67,445
KA2	1,023
LA2	5,967
MA2	598
NA2	14,648
OA4	1,270,356
PA2	26,231
QA4	1,378,495
RA3	445,523
SA4	7,047
TA2	1,042
UA4	234,301
VA2	26,253
WA4	19,282
XA2	32,445
YA4	277,911
ZA2	64,831
AB4	1,986,907
BB2	127,967
CB2	3,587
DB2	103,580
EB2	10,606
FB4	48,705
GB2	21,616
HB2	67,485
IB2	217,672
JB4	782,882
KB2	10,003

Density 1 =	0
Density 2 =	1,285,928
Density 3 =	445,523
Density 4 =	8,846,888
Total =	10,578,338

New Point Comfort, Va.
VIMS Map # 132

AA2	367,286
BA2	291,407
CA4	5,247,032
DA4	81,805
EA4	651,126
FA2	330,292
GA3	174,286
HA3	307,747
IA4	1,172,207
JA2	50,341
KA4	855,557
LA1	114,714
MA1	69,400
NA4	990,454
OA2	132,173
PA1	476,262
QA4	54,856
RA1	132,645
SA2	739,793
TA2	24,714
UA1	6,431
VA1	1,525
WA4	368,199
XA3	360,329
YA4	223,432
ZA3	112,950
AB2	33,422
BB3	1,549,208
CB1	12,946
DB4	99,006
Density 1 =	813,922
Density 2 =	1,969,427
Density 3 =	2,504,520
Density 4 =	9,743,674
Total =	15,031,543

Cape Charles, Va.
VIMS Map # 133

AA2	265,108
BA4	1,435
CA4	19,220
DA2	141,625
EA4	249,818
FA2	41,638
GA2	28,704
HA2	1,408
IA3	13,867
JA2	70,611
KA2	384,274
LA4	609,470
MA2	34,877
NA2	47,262
OA2	149,099
PA1	533,424
QA3	213,529
RA2	865,281
SA3	919,985
TA2	67,170
Density 1 =	533,424
Density 2 =	2,097,057
Density 3 =	1,147,382
Density 4 =	879,943
Total =	4,657,806

Cheriton, Va.
VIMS Map # 134

AA3	5,954
BA2	240,809
CA4	367,599
DA1	72,836

EA1	254,447
FA2	26,553
Density 1 =	327,284
Density 2 =	267,361
Density 3 =	5,954
Density 4 =	367,599
Total =	968,198

Yorktown, Va.
VIMS Map # 139

AA1	926
BA2	8,840
CA1	4,160
DA2	3,138
EA2	3,193
FA1	4,914
Density 1 =	10,000
Density 2 =	15,172
Density 3 =	0
Density 4 =	0
Total =	25,172

Poquoson West, Va.
VIMS Map # 140

AA4	32,214
BA4	31,315
CA4	84,533
DA3	436,065
EA2	175,275
FA4	443,452
GA1	92,844
HA2	28,001
IA3	163,205
JA2	21,829
KA2	2,211
LA3	80,416
MA2	1,584
NA2	40,241
OA3	187,771
PA2	355,538
QA1	610,566
RA3	564,252
SA3	58,524
TA2	82,888
UA4	636,101
VA2	824,099
WA1	96,023
XA4	808,815
YA2	94,806
ZA2	46,731
AB1	28,499
BB1	3,586
CB4	39,802
DB4	49,618
EB4	63,971
Density 1 =	831,519
Density 2 =	1,673,203
Density 3 =	1,490,233
Density 4 =	2,189,821
Total =	6,184,776

Poquoson East, Va.
VIMS Map # 141

AA1	56,607
BA2	623,254
CA4	5,572,292
DA3	787,979
EA4	573,908
FA4	62,226
GA4	19,119
HA4	9,655
IA3	1,894
JA4	8,481
KA1	946
LA1	1,723,007
MA3	2,377,833

Density 1 =	1,780,559
Density 2 =	623,254
Density 3 =	3,167,707
Density 4 =	6,245,680
Total =	11,817,200

Elliotts Creek, Va.
VIMS Map # 142

AA2	1,136,293
Density 1 =	0
Density 2 =	1,136,293
Density 3 =	0
Density 4 =	0
Total =	1,136,293

Hampton, Va.
VIMS Map # 147

AA4	40,070
BA1	45,348
CA3	174,783
DA4	187,160
EA3	296,875
FA3	147,352
GA4	108,539
HA1	330,342
IA3	102,294
JA3	108,097
KA4	412,110
LA3	48,162
MA3	59,288
NA3	21,664
OA1	15,110
PA2	647,765
QA4	531,122
RA4	327,990
SA1	65,858
Density 1 =	456,658
Density 2 =	647,765
Density 3 =	958,515
Density 4 =	1,606,992
Total =	3,669,930

Cape Henry, Va.
VIMS Map # 152

AA2	51,606
BA3	60,157
CA3	9,253
DA2	22,308
EA1	11,766
FA1	4,846
GA1	52,262
Density 1 =	68,874
Density 2 =	73,914
Density 3 =	69,410
Density 4 =	0
Total =	212,198

Port Tobacco, Md.
VIMS Map # 161

AA4	122,124
Density 1 =	0
Density 2 =	0
Density 3 =	0
Density 4 =	122,124
Total =	122,124

Charlotte Hall, Md.
VIMS Map # 162

AA4	46,044
Density 1 =	0
Density 2 =	0

Density 3 =	0
Density 4 =	46,044
Total =	46,044

Assawoman Bay, Md.
VIMS Map # 166

AA1	14,022
BA1	22,679
CA1	139,157
DA1	27,691
Density 1 =	203,549
Density 2 =	0
Density 3 =	0
Density 4 =	0
Total =	203,549

Berlin, Md.
VIMS Map # 167

AA2	7,210
BA4	28,384
CA3	16,518
DA3	42,828
EA2	6,453
FA3	14,353
GA3	10,382
HA1	27,492
Density 1 =	27,492
Density 2 =	13,663
Density 3 =	84,082
Density 4 =	28,384
Total =	153,620

Ocean City, Md.
VIMS Map # 168

AA4	9,029
BA3	3,687
CA3	250,277
DA2	5,509
EA2	26,463
FA2	7,752
GA2	2,600
HA2	25,293
Density 1 =	0
Density 2 =	67,617
Density 3 =	253,964
Density 4 =	9,029
Total =	330,610

Tingles Island, Md.
VIMS Map # 170

AA2	26,122
CA3	1,156,132
DA4	5,702,765
EA4	15,075
FA2	21,582
GA1	207,346
IA2	16,872
JA2	12,735
KA2	8,458
LA3	2,380,898
MA2	495,212
NA2	4,320
OA2	180,920
PA3	720,587
QA2	424,667
RA4	185,708
SA2	81,865
TA2	225,082
UA2	33,169
Density 1 =	207,346
Density 2 =	1,531,005
Density 3 =	4,257,617
Density 4 =	5,903,548

Total =	11,899,515

Boxiron, Md.-Va.
VIMS Map # 172

AA2	315,649
BA4	2,660,002
CA2	342,305
DA2	53,203
EA2	2,001,766
FA3	104,010
GA2	1,293,423
HA4	28,978
IA2	126,642
JA2	11,897
KA1	93,073
LA4	409,015
MA2	170,053
NA2	564,117
Density 1 =	93,073
Density 2 =	4,879,055
Density 3 =	104,010
Density 4 =	3,097,994
Total =	8,174,133

Whittington Point, Md.-Va.
VIMS Map # 173

AA1	16,914
BA1	297,108
CA4	474,162
DA2	906,468
EA3	497,649
FA2	1,452,866
GA3	810,230
HA3	39,417
IA2	3,261
JA1	18,410
Density 1 =	332,432
Density 2 =	2,362,595
Density 3 =	1,347,296
Density 4 =	474,162
Total =	4,516,485

Chincoteague West, Va.
VIMS Map # 174

AA4	139,216
Density 1 =	0
Density 2 =	0
Density 3 =	0
Density 4 =	139,216
Total =	139,216

Chincoteague East, Va.
VIMS Map # 175

AA4	9,713,411
BA2	498,189
CA1	72,306
DA2	21,987
EA2	2,184
FA2	39,021
Density 1 =	72,306
Density 2 =	561,381
Density 3 =	0
Density 4 =	9,713,411
Total =	10,347,098

East of New Point Comfort, Va.
VIMS Map # 177

AA1	172,890
BA4	12,657
Density 1 =	172,890
Density 2 =	0
Density 3 =	0

Density 4 =	12,657
Total =	185,547

Bethel Beach, Va.
VIMS Map # 178

AA3	3,580
BA3	6,281
CA1	47,676
Density 1 =	47,676
Density 2 =	0
Density 3 =	9,860
Density 4 =	0
Total =	57,536

Goose Island, Va.
VIMS Map # 179

AA2	22,041
BA2	56,920
CA3	303,577
DA2	888,525
EA1	206,368
FA3	296,395
Density 1 =	206,368
Density 2 =	967,485
Density 3 =	599,972
Density 4 =	0
Total =	1,773,826

APPENDIX E

1993 Submerged Aquatic Vegetation Ground Survey Data Listed by USGS 7.5 Minute Quadrangle and by 1993 Bed.

KEY

* Abbreviations under column "Species" are as follows:

Zm	-	*Zostera marina* (eelgrass)
Rm	-	*Ruppia maritima* (widgeon grass)
C	-	*Chara* sp. (muskgrass)
Cd	-	*Ceratophyllum demersum* (coontail)
Ec	-	*Elodea canadensis* (common elodea)
Hd	-	*Heteranthera dubia* (water stargrass)
Hv	-	*Hydrilla verticillata* (hydrilla)
Ms	-	*Myriophyllum spicatum* (Eurasian watermilfoil)
N	-	*Najas* spp. (naiad)
Nfl	-	*Najas flexilis* (northern naiad)
Ngr	-	*Najas gracillima* (slender naiad)
Ngu	-	*Najas guadalupensis* (southern naiad)
Nm	-	*Najas minor* (no common name)
Pcr	-	*Potamogeton crispus* (curly pondweed)
Pe	-	*Potamogeton epihydrus* (leafy pondweed)
Ppc	-	*Potamogeton pectinatus* (sago pondweed)
Ppf	-	*Potamogeton perfoliatus* (redhead-grass)
Ppu	-	*Potamogeton pusillus* (slender pondweed)
Tn	-	*Trapa natans* (water chestnut)
Va	-	*Vallisneria americana* (wild celery)
Zp	-	*Zannichellia palustris* (horned pondweed)
U	-	Unknown species composition

** Abbreviations under column "Surveyor" are as follows:

Cit.	-	Citizens' Survey
Harford	-	Harford Community College
PARK	-	Patuxent River Park Staff
Pines	-	Ocean Pines Boat Club
USFWS	-	United States Fish and Wildlife Service
USGS	-	United States Geological Survey
VIMS	-	Virginia Institute of Marine Science

\ - Slash mark separates species data of independent survey sources and independent survey dates.

- No SAV bed mapped from 1992 or 1993 aerial photography but SAV bed presence was verified by 1993 groundtruth survey at this location.

* - No SAV bed mapped from 1993 aerial photography but SAV bed presence was verified by 1993 groundtruth survey at this location.

APPENDIX E

1993 Submerged Aquatic Vegetation Ground Survey Data Listed by USGS 7.5 Minute Quadrangle

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
002	FA3	*	Ms,U	Cit.	09-24
	EA3	GA4	Hd,Hv,Ms,Va,U\ Ms,Hv,Va,Cd,Hd	Cit.\Harford	09-24\09-11
	DA3	HA4	Ms	Cit.	09-24
	AA4	AA4	Hd,Hv,Ms,Va	Cit.	09-24
	GA3	IA4	Ms	Harford	09-11
	HA3	EA3	Ms,Hv,Va,Cd	Harford	09-11
003	HA1	EA1	Hv,Ms\ Ms	Cit.\Harford	06-15\09-11
	AA2	AA2	Ms\ Ms,Va	Cit.\Harford	06-15\09-11
	QA4	OA4	Ms,U\ Ms,Hv,Cd	Cit.\Harford	09-24\09-11
	SA3	PA4	Ms	Cit.	09-24
	TA4	QA4	Ms	Cit.	09-24
	VA4	RA4	Ms\ Ms,Hv,Hd,Cd	Cit.\Harford	09-24\09-11
	UA4	SA4	Ms	Cit.\Harford	09-24\09-11
	XA4	TA3	Ms\ Ms,Hv,Hd,Cd	Cit.\Harford	09-24\09-11
	YA4	UA3	Hd,Hv,Ms\ Ms, Hv	Cit.\Harford	09-24\09-11
	AB4	YA4	Hd,Ms	Cit.	09-24
	BB4	ZA3	Hd,U\ Ms,Hd,Hv,Cd	Cit.\Harford	09-24\09-11
	DB4	DB4	Hv,Ms,U\ Ms,Hv,Va,Cd	Cit.\Harford	09-24\09-11
	EB4	EB4	Hv,Ms,U\ Ms,Hv,Hd,Cd,Va	Cit.\Harford	09-24\09-11
	FB4	FB4	Hv,Ms,U\ Ms,Hv,Va	Cit.\Harford	09-24\09-11
	XB3	AB4	Ms,Hd\ Ms,Hv	Cit.\Harford	09-24\09-11
	WB2	BB4	Ms,U\ Ms,Hv,Hd,Cd	Cit.\Harford	09-24\09-11
	VB4	WA4 (east)	Ms,U\ Ms,Hd,Cd	Cit.\Harford	09-24\09-11
	VB4	WA4 (west)	Ms,U\ Ms,Hd,Cd	Cit.\Harford	09-24\09-11
	LA2	JA4	Ms\ Ms,Cd	Cit.\Harford	09-24\09-11
	KA2	IA4	Ms\ Ms,Hv	Cit.\Harford	09-24\09-11
	OA4	MA4 (Bainbridge)	Ms,Hv,U\ Ms,Hv,Cd	Cit.\Harford	09-24\09-11
	OA4	MA4 (Bainbridge)	Ms,Hv,Cd	Harford	09-11
	OA4	MA4 (Happy Valley)	Ms,Cd	Harford	09-11
	CA4	BA2	Ms	Harford	09-11

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
003	EA1	CA2	Ms,Hv,Cd	Harford	09-11
	GA4, FA1	DA2 (Stump Pt.)	Va,Ms,Hd,Hv	Harford	09-11
	GA4, FA1	DA2 (Perry)	Ms,Hd	Harford	09-11
	GA4	FA4 (Perry Pt.)	Va,Ms,Hv,Cd	Harford	09-11
	GA4	FA4 (Perry Pt. Med. Ctr.)	Hv,Ms	Harford	09-11
	GA4	FA4 (Perry Pt. Park)	Hv,Va,Ms	Harford	09-11
	GA4	FA4 (Perry)	Va,Hv,Ms	Harford	09-11
	JA2	HA4	Ms\ Ms,Hv	Cit.\Harford	09-24\09-11
	MA4	KA4 (Frenchtown)	Hv,Ms,U\ Ms,Hv,Cd	Cit.\Harford	09-24\09-11
	MA4	KA4 (Toll Rd.)	Ms,Cd	Harford	09-11
	NA4	LA4	Ms,Cd	Harford	09-11
	ZA3	VA3	Ms,Hv	Harford	09-11
	CB4	CB4	Ms,Hv,Va,Hd,Cd	Harford	09-11
	GB4	GB4	Hv,Ms,Hd	Harford	09-11
	HB4	HB4	Ms,Va,Hv,Hd	Harford	09-11
	IB4	IB4	Ms,Va,Hv,Hd,Cd	Harford	09-11
	JB4	JB4	Ms,Va,Hv,Hd	Harford	09-11
	LB1	LB1	Ms,Va	Harford	09-11
	NB4	MB4	Ms,Hv,Va,Hd,Cd,Ngu	Harford	09-11
	OB4	NB4 (Todd Pk.)	Ms,Hv,Va,Hd,Cd	Harford	09-11
	OB4	NB4 (Nat. Guard Reserv.)	Ms,Hv,Hd,Va	Harford	09-11
	OB4	NB4 (south)	Ms,Hv,Hd	Harford	09-11
	QB4	OB3 (south)	Ms,Hv,Hd	Harford	09-11
	QB4	OB3 (north)	Ms,Hv,Hd	Harford	09-11
	RB4	PB3 (south)	Ms,Va,Cd,Hv	Harford	09-11
	RB4	PB3 (south-middle)	Ms,Va,Cd,Hv	Harford	09-11
	RB4	PB3 (middle)	Ms,Hv,Va	Harford	09-11
	RB4	PB3 (north-middle)	Ms,Hv,Va	Harford	09-11
	RB4	PB3 (north)	Ms,Hv	Harford	09-11
	SB2	QB2	Ms,Cd,Hd	Harford	09-11
	TB2	RB2	Ms,Hd	Harford	09-11
004	BA1	DA1	Ms,U\ Ms	Cit.\Harford	08-07\09-11
	AA1	CA1	Ms	Cit.\Harford	08-07\09-11
	CA1	AA2	Ms	Cit.\Harford	08-07\09-11
	DA1	*	Ms	Cit.	08-07

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
004		Piney Cr.#	Pcr,Va	Cit.	08-97
	FA1	FA1	Ms	Harford	09-11
	EA1	EA1	Ms	Harford	09-11
		BA1	Ms	Harford	09-11
009	BB1	KB4	Ms,Hv	Harford	09-29
	BB1	JB2	Va,Hd,Ms,Ngu	Harford	09-29
	AB2	LB2	Ms	Harford	09-29
		VA2	Ms,Hv	Harford	09-29
	PA2	UA2	Ms,Hv	Harford	09-29
	OA2	TA3	Ms	Harford	09-29
	KA2	RA2	Ms	Harford	09-29
	IA2	RA2	Ms,Hv	Harford	09-29
	RA3	YA3	Ms	Harford	09-29
	UA3	AB2	Ms	Harford	09-29
		GA1	Ms	Harford	09-29
	AA2	BA2	Ms	Harford	10-03
		AA1	Ms	Harford	10-03
010	IA1	HA1	Ms	Harford	09-19
	IA1	IA1	Ms	Harford	09-19
	HA2	JA2	Va,Ms	Harford	09-19
	GA2, FA1	KA2	Ms,Va,Ppc,Hd	Harford	09-19
	JA2	GA1	Ms	Harford	09-19
	BA1	DA2	Ms,Va	Harford	09-19
	FA1	LA2	Va,Ms	Harford	09-19
	FA1	MA3	Ms,Va,Hd	Harford	09-19
	FA1	NA1	Va	Harford	09-19
	FA1	NA1	Ms	Harford	09-19
	FA1	OA1	Ms	Harford	09-19
	EA3	PA4	Va,Ms	Harford	09-19
	DA2	FA3	Ms,Va	Harford	09-19
	CA2	FA3	Ms,Va,Hd	Harford	09-19
		EA1	Ms	Harford	09-19
	AA2	CA3	Ms,Va	Harford	09-19

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
013	CA2	CA2	Cd,Ec,Ms,Pcr,Va,Zp	Cit.	06-01
		Galloway Cr.#	Cd,Ec,Ms,Pcr	Cit.	04-08
		Baltimore Yacht Club#	Cd,Ec,Ms,Pcr	Cit.	04-08
014	IA2	HA2	Va,Ms,Ec,Cd	Harford	10-06
	HA2	GA1	Ms,Ec	Harford	10-06
	GA3	FA2	Va,Ms,Ec	Harford	10-06
	EA4	DA2	Va,Ms,Ec	Harford	10-06
	YA3	IA3	Ms,Ec,Va	Harford	10-06
	TA2	JA2	Ms	Harford	10-06
016	CA2	GA1	Ms	Harford	10-03
		FA1	Ms	Harford	10-03
		EA1	Ms	Harford	10-03
	BA3	DA2	Ms	Harford	10-03
		CA1	Ms,Va	Harford	10-03
		BA3	Ms,Va	Harford	10-03
		AA3	Ms,Va	Harford	10-03
017	BA4	BA4	Ms	Harford	10-03
		CA1	Ms	Harford	10-03
023		Cockley Cr.#	Zp	Cit.	06-15
		Cattail Cr.#	Zp	Cit.	06-24
		Mill Cr.#	Zp	Cit.	06-15
024		Little Magothy R.#	Zp	Cit.	06-24
		Little Magothy R.#	Zp	Cit.	06-24
		Little Magothy R.#	Zp	Cit.	06-24
		Deep Cr.#	Zp	Cit.	06-24
		Deep Cr.#	Zp	Cit.	06-24
		AA2	Ppc,Zp\ Ppc	USFWS	06-24\08-20
		Shore Acres#	Cd,Ms,Zp	Cit.	06-24
		BA2	Cd,Ms,Zp	Cit.	06-24
		Ulmsteads Pt.#	Ms,Ppf,Rm	Cit.	06-24

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
024		Forked Cr.#	Zp	Cit.	06-24
		Cool Spring Cove#	Zp	Cit.	06-24
		Springs Pond#	Zp	Cit.	06-24
		Blackhole Cr.#	Zp	Cit.	06-24
		Blackhole Cr.#	Zp	Cit.	06-24
		Blackhole Cr.#	Zp	Cit.	06-24
		Chest Neck#	Zp	Cit.	06-24
		Broad Cr.#	Zp	Cit.	06-24
		Park Cr.#	Zp	Cit.	06-24
		CA2	Ppc	USFWS	06-24\08-20
		Grays Cr.#	Zp	Cit.	06-24
		Grays Cr.#	Zp	Cit.	06-24
		Grays Cr.#	Zp	USFWS	06-24\08-20
		DA2	Ppc	USFWS	06-24\08-20
		EA2	Rm	USFWS	08-24\08-20
		Tar Cove#	Zp	Cit.	06-24
		Cornfield Cr.#	Zp	Cit.	06-24
		Cornfield Cr.#	Zp	Cit.	06-24
		IA3	Ec,Rm	USFWS	06-24\08-20
		Redhouse Cove#	Zp	Cit.	06-24
		HA2	Ec,Rm	USFWS	06-24\08-20
		GA2	Zp\ Nfl	Cit.\USFWS	06-24\08-20
		Magothy Narrows#	N	USFWS	06-24\08-20
		FA2	Ppf,Rm	USFWS	06-24\08-20
		Bayberry#	Ec	Cit.	06-24
026		Durdin Cr.#	Rm	USFWS	08-18
		PA2	Ppf,Rm	USFWS	08-18
		OA3	Ppf	USFWS	08-20
		NA2	Ms	USFWS	08-20
		MA2 (north)	Ms,Ppf,Rm	USFWS	08-20
		MA2 (south)	Cd,Ec,N,Ppf,Rm	USFWS	08-20
		LA3 (south)	Rm	USFWS	08-20
	JA2	LA3 (Little Gum Pt.)	Rm	Cit.\USFWS	No Date\08-20
	JA2	LA3 (Spring Pt.)	Rm	USFWS	08-20
	JA2	KA2	Rm,Nfl	USFWS	08-20

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
026	NA2	HA3	Cd,N,Rm\ Cd,Nfl,Rm	Cit.\USFWS	No Date\08-20
	PA2	GA3	Rm	Cit.\USFWS	No Date\08-20
028		DA3	Hv	USGS	07-20-22
		CA3	Ms,Hv,U	USGS	07-20-22
030		Muddy Cr.#	Rm	Cit.	08-09
		Selby Bay#	Rm	Cit.	08-15
		Selby Bay#	Zp	Cit.	05-17
		Selby Bay#	Rm	Cit.	08-15
		Limehouse Cove#	Rm	Cit.	08-15
		Cedar Pt.#	Rm	Cit.	08-15
		Glebe Bay#	Rm	Cit.	08-15
		Glebe Bay#	Rm	Cit.	08-15
		Beards Cr.#	Rm	Cit.	08-09
		Beards Cr.#	Rm	Cit.	08-09
		Crab Cr.#	Zp	Cit.	05-29
		Spa Cr.#	Zp	Cit.	06-10
		Hillsmere Shores #	Rm	Cit.	08-15
031		Flagg Pond#	Rm	Cit.	08-15
		Duvall Cr.#	Rm	Cit.	08-15
		Cherrytree Cove#	Rm	Cit.	08-15
		Oyster Cr.#	Rm	Cit.	08-15
		Lk. Ogleton#	Ppu,Zp	Cit.	06-01
		Heron Lk.#	Rm	Cit.	08-15
		Back Cr.#	Zp	Cit.	04-15
		Spa Cr.#	Zp	Cit.	06-10
		Meadow Pt.#	Rm	Cit.	08-15
		Severn Beach#	Rm	Cit.	08-15
		Hackett Pt.#	Rm	Cit.	08-15
032	AA3	QA3 (north)	Rm,Zp	VIMS	07-20
		QA3 (south)	Rm,Zp	VIMS	07-20
	HA1	HA2	Rm	VIMS	07-20
		GA1	Rm	VIMS	07-20

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
033		Kent Is.#	Zp	Cit.	07-15
		Kent Narrows#	Ms,Ppf,Zp	Cit.	07-15
		NA3	Ppf,Zp	Cit.	07-15
		PA3	Ppf,Zp	Cit.	07-15
		Wye R.#	Rm	Cit.	08-01
		Wye R.#	U	Cit.	08-01
		Wye R.#	U	Cit.	08-01
		Hood Pt.#	Rm	Cit.	06-27
	HA3	MA3	Ppf,Rm,Zp	Cit.	07-15
	GA2	LA3	Ms,Ppf,Zp	Cit.	07-15
		IA3	Rm	VIMS	07-20
034		YA4	Va,Hv,Ms,Hd	USGS	07-20-22
		XA2	Va,Hv,Ms,Hd	USGS	07-20-22
		WA4	Va,Hv,Ms,Hd	USGS	07-20-22
		RA2, QA1	Hd,Hv,Va	USGS	07-20-22
		PA4	Va,Ms,Hd	USGS	07-20-22
		MA3	Cd,Ms,Ppc,Va,Hv,Pcr,Nm,Hd	USGS	07-20-22
		LA2	Va,Hv,Ms	USGS	07-20-22
		OB4 (Goose Is.)	Ms,Hv,Cd	USGS	07-20-22
		OB4 (Fox Ferry Pt.)	Ms,Hv,Cd	USGS	07-20-22
		OB4 (south)	Hv,Ms	USGS	07-20-22
		PB4	Hv,Ms	USGS	07-20-22
		UB2 (north)	Va,Ms,Hv	USGS	07-20-22
		UB2 (south)	Hv,Va,Cd,Hd,Ms	USGS	07-20-22
		Indian Queen Bluff#	Hv,Va,Cd,Hd,Ms	USGS	07-20-22
036		WA3	Zp	Cit.	06-13
		Northeast Branch#	Zp	Cit.	07-04
		SA2	Rm,Zp	Cit.	08-15
		Broad Cr.#	Ppf	Cit.	06-27
		Broad Cr.#	Rm	Cit.	06-27
	DA2	*	Rm	Cit.	06-27
		DB1 (south)	Rm,Zp	VIMS	07-20
		FB2 (north)	Rm,Zp	VIMS	07-20
		FB2 (south)	Rm,Zp	VIMS	07-20

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
037		RA4	Ppf	Cit.	06-27
	BA2	MA3 (north)	Rm	VIMS	07-20
	BA2	MA3 (south)	Rm	VIMS	07-20
039		IA4 (north)	Va,Hv,Ms	USGS	07-20-22
		IA4 (south)	Cd,Ms,Hv,Va,Nm	USGS	07-20-22
		Whitestone Pt.#	Cd, Ms,Hv,Va.,Nm	USGS	07-20-22
		Gunston Hall#	Va,Ms	USGS	07-20-22
		FA2 (north)	Hv,Va,Ms	USGS	07-20-22
		FA2 (south)	Va,Ms	USGS	07-20-22
		EA1	Va,Ms,Hv	USGS	07-20-22
		DA4	Ms,Hv,Va,Nm	USGS	07-20-22
040		Broad Cr.#	Hv	USGS	07-20-22
		IA4	Va,Hv	USGS	07-20-22
		GA4	Hv,Hd	USGS	07-20-22
		Mockley Pt.#	Hv,Hd	USGS	07-20-22
		CA4	Hv,Hd	USGS	07-20-22
		BA4 (Nat. Colonial Farm)	Cd,Hv,Ms	USGS	07-20-22
		BA4	Ms,Hv,Va,Cd	USGS	07-20-22
	BA4	BA4 (River Rd.)	Ms,Hv,Va,Cd	USGS	07-20-22
	BA4	BA4 (Fenwick)	Hv,Ms,Va\ Ms,Hv	Cit.\USGS	06-26\07-20-22
		Ferry Pt.#	Hv	USGS	07-20-22
		Sheridan Pt.#	Hv	USGS	07-20-22
		Potomac R.#	Ppc,Hv	USGS	07-20-22
		NA2	Hv,Nm,Va,Ms	USGS	07-20-22
		OA1	Hv,Nm,Va,Ms	USGS	07-20-22
041		Mataponi Cr.#	Nm,Pcr	PARK	07-14
		Mataponi Cr.#	Nm,Pcr,Ec	PARK	08-05
		Lyons Cr.#	Ec	PARK	08-05
		Cocktown Cr.#	Cd,Ec,Pcr,Ngu,Va	PARK	07-30
		Swamp Cr.#	Cd,Ec,Pcr	PARK	07-30
043		Balls Cr.#	Rm	Cit.	07-01
	AA3	CA2	Rm,Zp	VIMS	07-21

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
043	AA3	BA2 (west)	Rm	VIMS	07-21
	AA3	BA2 (east)	Rm	VIMS	07-21
	AA3	AA2	Rm	VIMS	07-21
		HA2	Rm	VIMS	07-21
		IA3	Rm	VIMS	07-21
	JA2	KA3 (south)	Rm	VIMS	07-21
	JA2	KA3 (north)	Rm	VIMS	07-21
	NA2	QA2	Rm	VIMS	07-21
044		Tar Cr.#	Zp	Cit.	06-16
		Plaindealing Cr.#	Zp	Cit.	06-16
		Tred Avon R.#	Zp	Cit.	06-16
		Trippe Cr.#	Zp	Cit.	06-16
		Bailey's Neck#	Zp	Cit.	07-16
		Goldsborough Cr.#	Rm,U	Cit.	07-16
		Boone Cr.#	U	Cit.	07-15
	RA2	BA3	Rm	Cit.	07-16
	QA2	CA3	Rm	Cit.	07-16
		PA2	Rm	VIMS	07-21
045		Westpoint Rd. Cove#	U	Cit.	06-15
047		CA4	Hv,Ms,Va,Hd,Cd,Nm,Ngu	USGS	07-20-22
		AA4	Hv,Va,Ms,Nm,Cd,Hd	USGS	07-20-22
		EA2	Hv,Va,Ms,Cd,Nm	USGS	07-20-22
		FA4	Hv,Nm,Va	USGS	07-20-22
		IA4	Hv,Ms,Va,Nm	USGS	07-20-22
		KA4	Hv,Va,Ms,Cd,Hd,Nm	USGS	07-20-22
	Possum Nose	MA4	Hv,Va,Ms,Cd	USGS	07-20-22
	Cherry Hill	MA4	Hv,Ms	USGS	07-20-22
		NA4	Hv,Ms	USGS	07-20-22
		PA4	Hv,Va,Ms,Hd	USGS	07-20-22
		QA2	Hv,Va,Ms	USGS	07-20-22
048	Chapman Pt.	JA4	Hd,Ms,Cd	USGS	07-20-22
	Glymont	JA4	Ms,Hv,Cd,Va	USGS	07-20-22

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
048		IA4	Hv,Ms,Va,Hd,Cd	USGS	07-20-22
		HA4	Hv,Ms,Va,Hd,Cd	USGS	07-20-22
	BA4	BA4	Nm,Hv,Va,Cd,Ms,Hd	USGS	07-20-22
	BA4	CA2	Hv,Ms,Cd	USGS	07-20-22
	BA4	CA2	Hv,Ms,Va	USGS	07-20-22
049		Patuxent R.#	Ec,Ngu,Pcr,Ppu,Zp	Cit.	06-13
		Patuxent R.#	Pcr,Ppu,Zp	Cit.	06-13
051	TA3	LA3, MA1	Rm	Cit.	06-01
	WA3	OA3	Rm	VIMS	07-21
	XA2	OA3	Rm	VIMS	07-21
	XA2,WA3	OA3	Rm	VIMS	07-21
	TA3	MA1	Rm	VIMS	07-21
	QA2	KA1	Rm	Cit.\VIMS	06-01\07-21
	SA1	KA1	Rm	Cit.\VIMS	06-01\07-21
	PA2	JA2	Rm	Cit.	06-01
	OA2	*	Rm	Cit.	06-01
	UA1	MA1	Rm	VIMS	07-21
		DA2	Zp	Clt.	06-15
052		IA3	Zp	Cit.	06-15
	HA3	*	Zp	Cit.	06-15
	FA2	HA2	Zp	Cit.	06-15
	GA3	*	Zp	Cit.	06-15
053		Chancellor Pt. (west)#	Zp	Cit.	Spring-Summer
		Chancellor Pt. (middle)#	Zp	Cit.	Spring-Summer
		Chancellor Pt. (east)#	Zp	Cit.	Spring-Summer
055		RA4	Va,Ms	USGS	07-20-22
	Clifton Beach	PA4	Va,Ms,Hd,Cd	USGS	07-20-22
	Wades Bay	PA4	Va,Ms,Hd,Nm,Cd,Hv	USGS	07-20-22
	Douglas Pt.	PA4	Va,Ms,Hd	USGS	07-20-22
		PA4	Ms,Va,Hv,Hd	USGS	07-20-22
		NA4	Hv,Va,Ms,Hd,Cd	USGS	07-20-22

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
055		LA4	Va,Ms,Hv,Hd	USGS	07-20-22
		JA4	Ms,Hd,Va,Hv,Nm,Ngu	USGS	07-20-22
	Clifton Pt.	JA4	Hv,Hd,Ms,Va,Cd,Nm,Ngu	USGS	07-20-22
060		Peterson's Pt.#	Zp	Cit.	05-15
		Wells Cove #	Rm,Zp	Cit.	05-15
		Island Creek#	Zp	Cit.	06-15
061		St. Leonard Cr.#	Zp	Cit.	06-15
		Cape Leonard (west)#	Zp	Cit.	06-15
		Cape Leonard (east)#	Zp	Cit.	06-15
		Osbourne Cove (west)#	Zp	Cit.	06-15
		Osbourne Cove (east)#	Zp	Cit.	06-15
		Breeden Rd.#	Zp	Cit.	06-15
		Osbourne Cove#	Zp	Cit.	06-15
068		Neale Sound.#	Zp	CIt.	05-18
070		Cuckold Cr.#	Zp	Cit.	06-06
071		Green Holly Pond#	Zp	CIt.	06-12
		Hominy Cr.#	Zp	Cit.	04-15
072	EA1	CA2	Rm	Cit.	06-15
	BA2	BA2	Rm	VIMS	07-22
	BA2	Great Cove#	Rm	VIMS	07-22
	BA2	Cove Pt.#	Rm	VIMS	07-22
073	NB3	IB3	Rm	VIMS	07-22
	NB3	GB4	Rm	VIMS	07-22
	HA4	EA4	Rm	VIMS	07-22
	FB3	YA3 (north)	Rm	VIMS	07-22
	FB3	YA3 (south)	Rm	VIMS	07-22
	FB3	YA3 (middle)	Rm	VIMS	07-22
	QA3	MA2	Rm	VIMS	07-22
	TA2	NA2 (north)	Rm	VIMS	07-22

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
073	TA2	NA2 (south)	Rm	VIMS	07-22
		UA2	Rm	VIMS	07-22
	AB3	UA2 (north)	Rm	VIMS	07-22
	AB3	UA2 (south)	Rm	VIMS	07-22
074	EA4	FA4	Rm	Cit.	05-15
076		Popes Cr. #	Ms	Cit.	10-09
078		Weatherall Cr. (east)#	Zp	Cit.	06-06
		Weatherall Cr. (west)#	Zp	Cit.	06-06
		Lwr. Machodoc Cr.#	Pcr	Cit.	06-12
		E. of Herring Pond#	Zp	Cit.	06-12
080	AA2	*	Rm	Cit.	08-31
	BA2	BA2	Rm	CIt.	08-31
084	AA2	BA3	Rm	Cit.	10-13
	BA2	CA2	Rm	Cit.	10-13
	CA2	DA2	Rm	Cit.	10-13
	DA2	GA2	Rm	Cit.	10-13
	EA2	GA2	Rm	Cit.	10-13
		Laws Thorofare#	Rm	Cit.	10-13
099	AA2	SA2	Rm	Cit.	05-22
	BA2	XAI, RA2	Rm,Zm	Cit.	05-22
	CA3	ZA4, SA2	Rm	Cit.	05-22
	RA3	WA2, UA3	Rm	Cit.	05-22
		Cheeseman Is.#	Rm	Cit.	05-22
		Hog Neck#	Rm	Cit.	05-22
100	NA2	JA1	Rm,Zm	VIMS	07-23
	LA2	HA1	Rm,Zm	VIMS	07-23
	WA2	QA4	Rm,Zm	VIMS	07-23
	WA2	RA2	Rm,Zm	VIMS	07-23
	WA2	RA2	Zm	VIMS	07-23

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
100	XA4	RA2	Rm,Zm	VIMS	07-23
	XA4	RA2	Zm	VIMS	07-23
101	NA2	*	Rm,Zm	VIMS	07-23
	OA2	MA2	Rm,Zm	VIMS	07-23
	CA3	CA3 (north)	Rm,Zm	VIMS	07-23
	CA3	CA3 (middle)	Rm,Zm	VIMS	07-23
	CA3	CA3 (south)	Rm,Zm	VIMS	07-23
	FA2	EA2	Rm,Zm	VIMS	07-23
	GA3	FA3 (north)	Rm,Zm	VIMS	07-23
	GA3	FA3 (south)	Rm,Zm	VIMS	07-23
106	GA4	FA4	Rm,Zm	Cit.	07-06
	HA3	*	Zm	Cit.	07-06
	EA1	DA1	Zm	Cit.	07-06
	DA4	CA4	Rm,Zm	Cit.	07-16
	AA1	AA1	Zm	Cit.	08-07
	BA2	*	Zm	Cit.	08-07
	CA2	BA2	Zm	Cit.	08-07
		Sandy Pt.#	Rm	Cit.	06-15
		GA2	Rm	Cit.	06-15
		Bull Neck#	Rm	Cit.	06-15
111	DA3	CA2	Rm,Zm	VIMS	06-17
	GA4	EA2	Rm	VIMS	06-17
	HA4	GA3	Rm	VIMS	06-17
	IA1	HA2	Rm,Zm	VIMS	06-17
	AB2	IA2	Rm	VIMS	06-17
	YA3	ZA2	Rm	VIMS	06-17
	LA4	JA2	Rm	VIMS	06-17
112	IB2	BB2	Rm,Zm	Cit.	07-01
	JB2	CB2	Rm,Zm	Cit.	07-01
	HB2	AB2	Zm	Cit.	07-01
	FB2	YA2	Zm	Cit.	07-01
	EB3	XA2	Zm	Cit.	07-01

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
112	PA3	*	Rm	Cit.	09-15
	MA4	LA2	Rm	Cit.	09-15
	LA2	KA2	Rm	Cit.	09-15
	QA3	MA2	Zm	Cit.	09-15
	TA3	PA3	Zm	Cit.	09-15
114	XA2	DB2	U	Cit.	09-09
	YA2	EB2	U	Cit.	09-09
118	GA2	IA2	Zm\Zm, Rm	Cit.\VIMS	08-07\06-16
	JA3	MA2	Zm	VIMS	06-16
	LA2	QA2	Zm	Cit.	08-07
	MA2	*	Zm	Cit.	08-07
	EA4	GA4	Zm\Zm, Rm	Cit.\VIMS	08-08\06-16
	FA2	HA2	Zm	Cit.	08-08
	CA4	FA2	Zm	Cit.	06-16
		PA2	Rm	VIMS	06-16
		OA2	Rm	VIMS	06-16
		CB1	Rm,Zm	VIMS	06-16
		DB4	Rm,Zm	VIMS	06-16
122	BA2	BA2	Rm,Zm	VIMS	06-05
123	NA2	LA2	Zm	VIMS	06-19
		MA2	Zm	VIMS	06-19
	UA2,TA4	BB3	Zm,Rm	VIMS	06-19
	VA3	AB1	Zm	VIMS	06-19
	VA3	ZA3	Zm	VIMS	06-19
	ZA2	NA4	Zm	VIMS	06-19
	BB3	OA4	Zm,Rm	VIMS	06-19
124	CB2	DB2	Rm,Zm	Cit.	07-02
	BB2	CB2	Rm,Zm	Cit.	07-02
	DB4	AB4	Zm	Cit.	07-02
	EB2	BB2	Zm	Cit.	07-02
	GB3	FB3	Zm	Cit.	07-02

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
124	HB3	GB2	Rm,Zm	Cit.	07-02
	IB2	HB2	Rm,Zm	Cit.	07-02
	KB3	JB2	Rm,Zm	Cit.	07-02
131	DA4	DA4	Zm	VIMS	06-29
	HA4	GA4 (east)	Zm	VIMS	06-01
	HA4	GA4 (west)	Zm	VIMS	06-01
	OA4	OA4 (north)	Rm,Zm	VIMS	06-01
	OA4	OA4 (south)	Rm,Zm	VIMS	06-01
	QA4	QA4	Rm,Zm	VIMS	06-01
	NB2	JB4	Rm,Zm	VIMS	06-05
	FB2	BB2	Zm	VIMS	06-05
	JB4	FB4	Zm	VIMS	06-05
132	GA3	GA3	Rm,Zm	Cit.	05-29
	CA4	CA4	Rm,Zm	VIMS	06-01
	CA4	CA4	Zm	VIMS	06-01
	QA1	PA1	Zm	VIMS	06-20
	RA4	QA4	Zm	VIMS	06-20
	OA4	NA4	Zm	VIMS	06-20
	OA4	NA4	Zm	VIMS	06-20
133	HA4	JA2	Zm	VIMS	JULY
139		CA1	Zm	VIMS	06-30
		BA2	Zm	VIMS	06-30
	AA2	AA1	Zm	VIMS	05-06
	BA2	FA1	Zm	VIMS	05-06
	CA2	EA2	Zm	VIMS	06-29
	DA3	DA2	Zm	VIMS	06-29
140	SA4	UA4	Rm,Zm	VIMS	06-20
	UA4	XA4	Rm,Zm	VIMS	06-30
	WA2	ZA2	Rm,Zm	VIMS	06-30
		AB1 (east)	Zm	VIMS	06-30
		AB1 (west)	Zm	VIMS	06-30

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
140		BB1	Zm	VIMS	06-29
	XA4	CB4	Zm	VIMS	06-29
152	CA2	BA3	Zm	Cit.	06-07
		DA2	Rm	Cit.	07-02
	BA2	BA3	Rm	Cit.	07-02
	AA2	AA2	Rm	Cit.	07-02
		The Narrows#	Rm	Cit.	07-02
159		Sand & Gravel Pits#	Cd	PARK	07-08
		Sand & Gravel Pits#	Cd	PARK	07-08
		Spyglass Is.#	Cd	PARK	07-08
		Trailer Park#	Cd,Pe,Ec,Pcr	PARK	07-08
		Back Channel#	Ngu,Hv,Nm,Pcr,Va,Cd,Ec,Ppu	PARK	07-08
		Mill Cr.- Rt. 4#	Ec,Cd,Ngu,Nm,Pcr,Va,Hv	PARK	07-08
		Mill Cr.#	Cd,Ec,Ngu,Nm	PARK	07-08
		Green Landing#	Nm,Cd,Ngu	PARK	07-08
		Leon#	Nm,Ec,Cd,Ngu,Pcr	PARK	07-08
		Bristol Landing#	Nm,Cd,Ec,Pcr	PARK	07-08
		Railroad Cr.#	Nm,Cd,Ec	PARK	07-08
		opp. Charles Branch#	Nm	PARK	07-08
		Charles Branch#	Pcr	PARK	07-14
		Western Branch#	Cd,Nm	PARK	07-14
		Marlboro Speedway#	Cd,Ec,Nm	PARK	07-14
		House Creek#	Nm,Pcr	PARK	07-14
161		AA4	Hv,Ms,Cd	USGS	07-20-22
166	67th Street		Rm,Zm	Cit.	07-27
	DA2	DA1	Rm	Cit.	07-27
	CA1		Rm,Zm	Cit.	07-27
		Horse Is.#	Rm	Cit.	07-27
	AA2	*	Rm	Cit.	08-02
	BA2	AA1	Rm	Cit.	08-02
		BA1	Rm	Cit.	08-02
	CA2	*	Rm	Cit.	08-02

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
166		Ocean City Exprwy.#	Rm	Pines	07-27
		Water tank#	Rm	Pines	07-27
		S. of CA1 #	Rm	Pines	07-27
		CA1	Rm	Pines	07-27
		CA1	Rm	Pines	07-27
		CA1	Rm	Pines	07-27
		Devil Is.#	Rm	Pines	07-27
		Devil Is.#	Rm	Pines	07-27
		Devil Is.#	Rm	Pines	07-27
167	CA4	GA3	Zm	Cit.	09-28
	DA2	BA4	Zm	Cit.	10-01
168	DA3	DA2	Zm	Cit.	09-28
	AA3	AA4	Rm,Zm	Cit.	10-01
		Water tank#	Rm	Pines	08-02
		Filtration Plant#	Rm	Pines	08-02
170	HA2	IA2	Zm	Cit.	06-11
		Tidal Flat#	Rm,Zm	Cit.	09-28
	OA3	UA2	Rm,Rm	Cit.	09-28
	KA3	QA2, PA3	Rm,Zm	Cit.	09-28
	MA3	TA2, SA2	Rm,Zm	Cit.	09-28
	IA3	LA3	Rm,Zm	Cit.	10-01
	JA4	MA2	Rm,Zm	Cit.	10-01
	DA4	DA4	Rm,Zm	Cit.	10-04
	CA3	CA3	Zm,Rm	Cit.	10-04
	BA2	*	Zm,Rm	Cit.	10-04
	FA2	DA4	Rm,Zm	Cit.	10-07
	EA2	EA4	Rm	Cit.	10-07
172	LA3	MA2	Zm	Cit.	10-04
	KA4	LA4, NA2	Zm	Cit.	10-05
	JA1	KA1	Rm,Zm	Cit.	10-05
	IA2	IA2	Zm	Cit.	10-05
	HA3	IA2	Zm	Cit.	10-05

Quad	1992 Bed	1993 Bed	Species**	Surveyor***	1993 Survey Date
172	GA4	HA4	Zm	Cit.	10-05
	AA4	BA4, AA2	Rm,Zm	Cit.	10-06
	BA3	CA2	Zm	Cit.	10-06
	CA2	DA2	Zm	Cit.	10-06
	DA3	EA2	Rm,Zm	Cit.	10-06
	FA3	GA2	Rm,Zm	Cit.	10-06
173	JA2	IA2	Rm,Zm	Cit.	10-04
	HA3	GA3	Rm,Zm	Cit.	10-04
	GA3	FA2	Rm,Zm	Cit.	10-04
	EA4	CA4	Zm	Cit.	10-05
	AA1	AA1	Zm	Cit.	10-05
	DA2	DA2	Rm,Zm	Cit.	10-05
	FA2	EA3	Rm,Zm	Cit.	10-05
	CA1	BA1	Rm,Zm	Cit.	10-07
175	EA3	FA2	Rm,Zm	Cit.	07-06
	AA4	AA4	Rm,Zm	Cit.	07-06

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